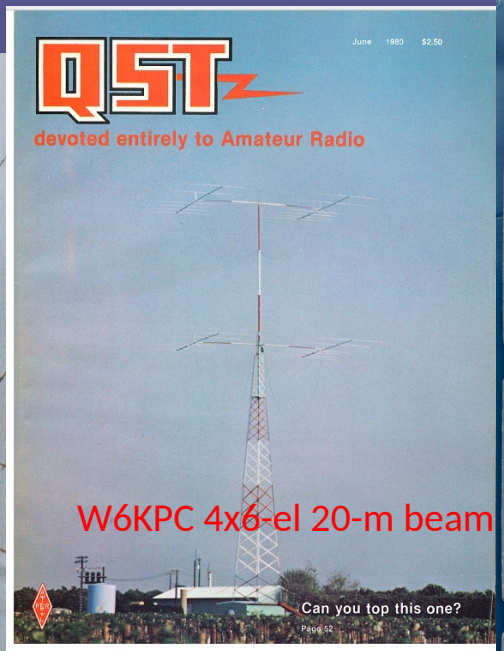
Renewal and Expansion of An Old 6-m TVRO into 7.8-m for EME

=== A *Dinosaur* Is (almost) Coming Back ===

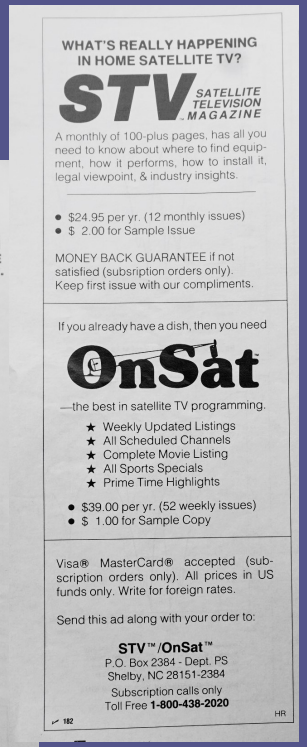
JH1KRC Mike (Michiaki Watanabe)

Before EME, I was an active HF operator, 1969-1995.

4-el. triband quad 1978
Data of Dr. Lindsay, W0HTH



Frank Clement's Collinear Yagi Sextet antenna as it appeared on the cover of the June 1980 issue of QST.



Ad's

Ham Radio

Aug. 1985

An Old Tale of My Two TVRO's

TVRO (1): PARACLIPSE 14-1/2' (4.4-m)

Second-handed, purchased in 1996. This has successfully been used for my EME operation since 2003.

TVRO (2): ORBITRON T-20 (6-m)

Purchased from the same OM. But it was ignored and buried in soil for years until a chance came in during the COVID-19 pandemic.

> Please read my proceeding paper for the details. TNX!

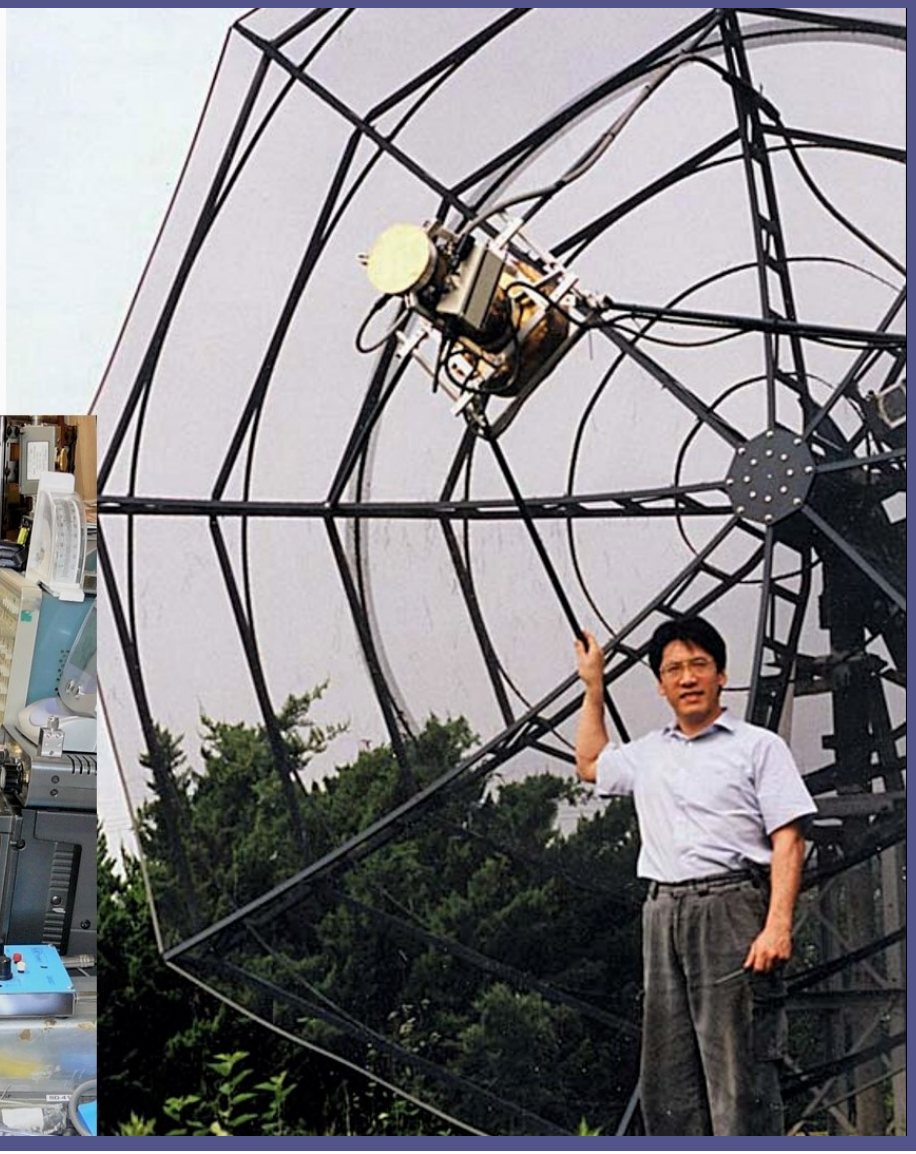
Montana Dinosaur Center <https://tmdinosaurcenter.org/>

JH1KRC

那須塩原 QM06aw

1296 /432MHz/5.7GHz

10.45GHz　TVRO 4.4 m

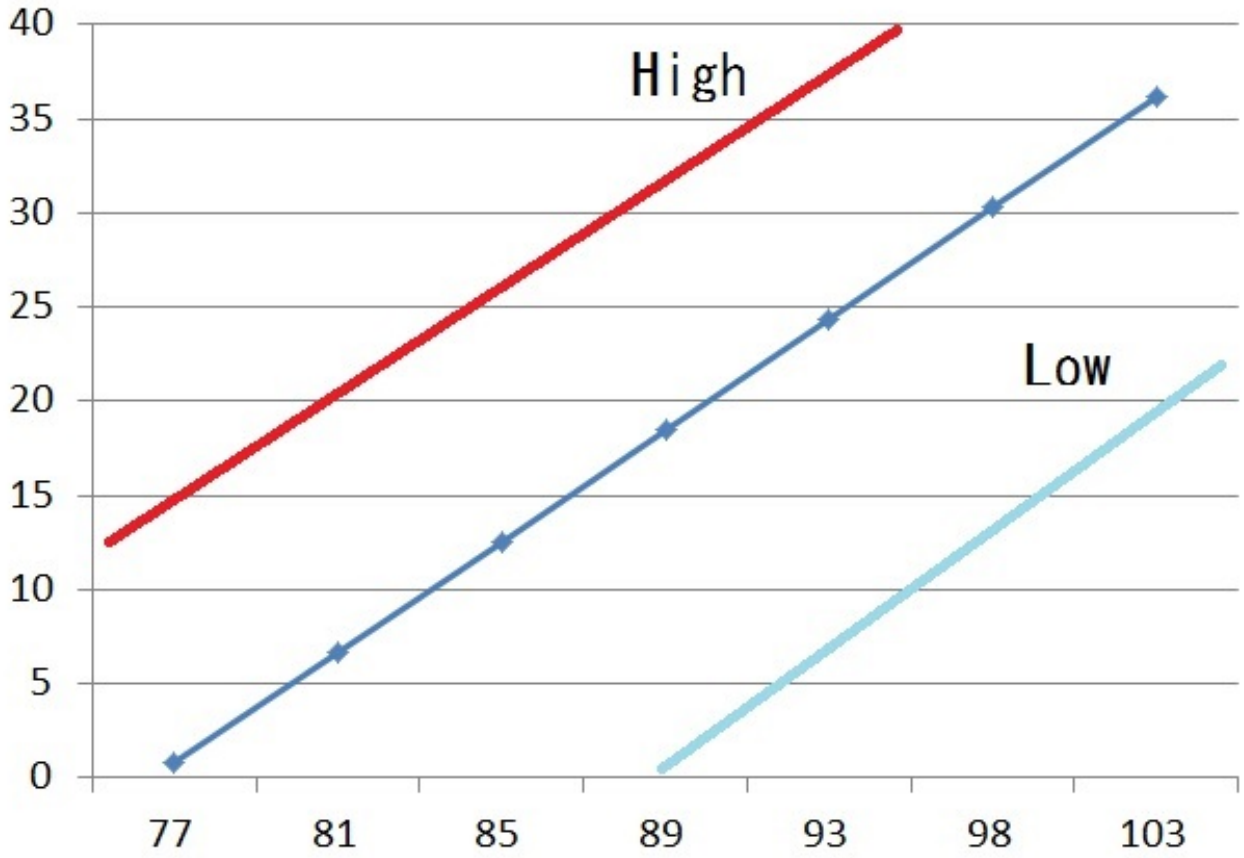


← Video camera

TVRO: Polar rotation

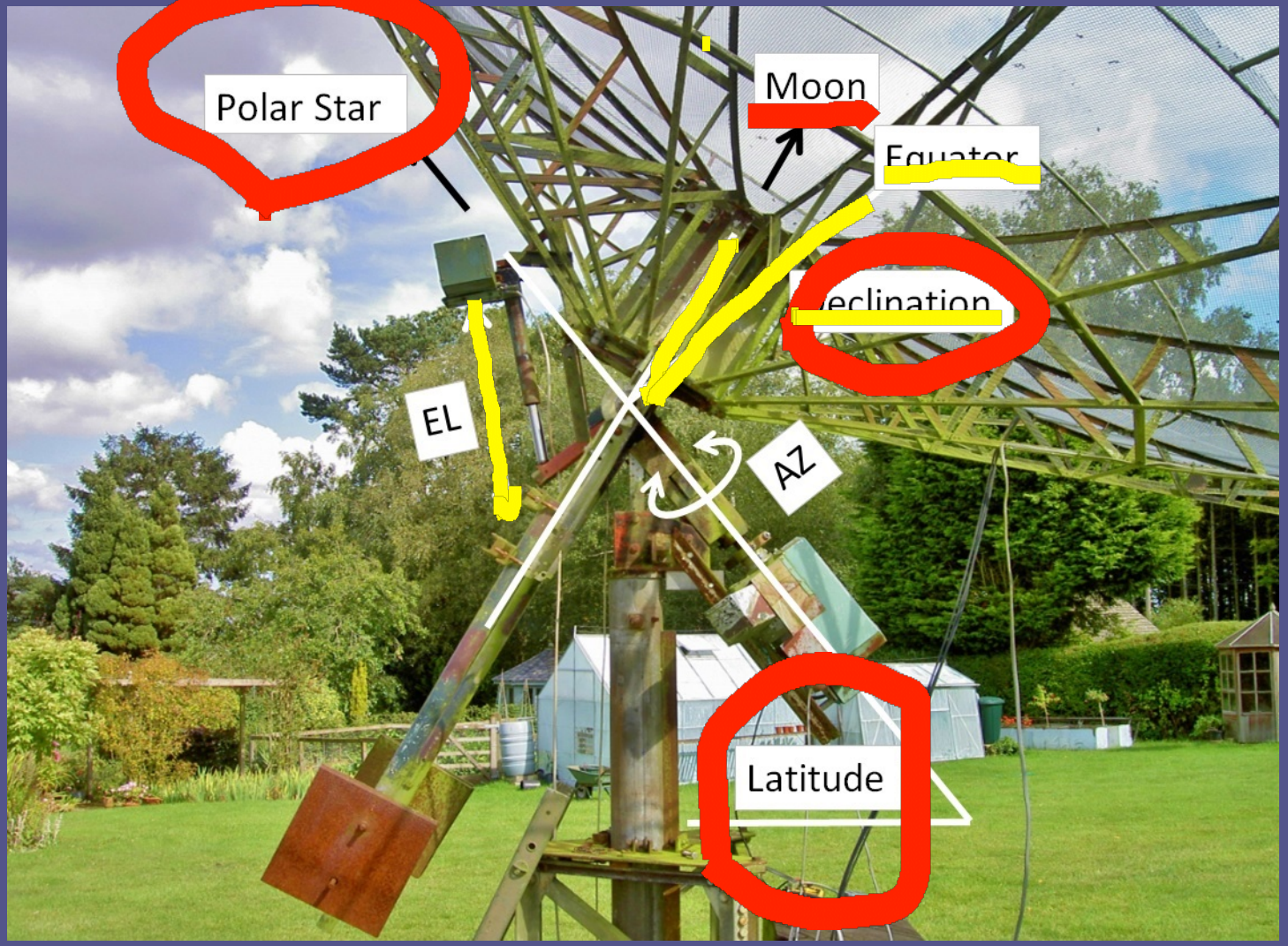
Simple direction.

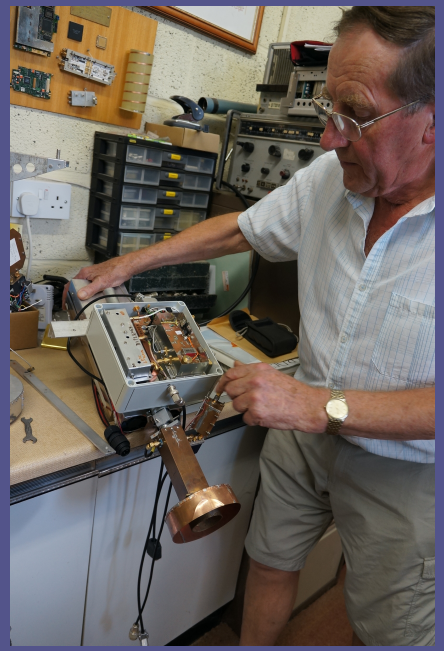
Not good for Sun-noise and sky-noise measurements.



The Moon Path

Declination
12.7 deg.





G3LTF Petr

1-5/8”
Foam Coax

Approx. 200 meters

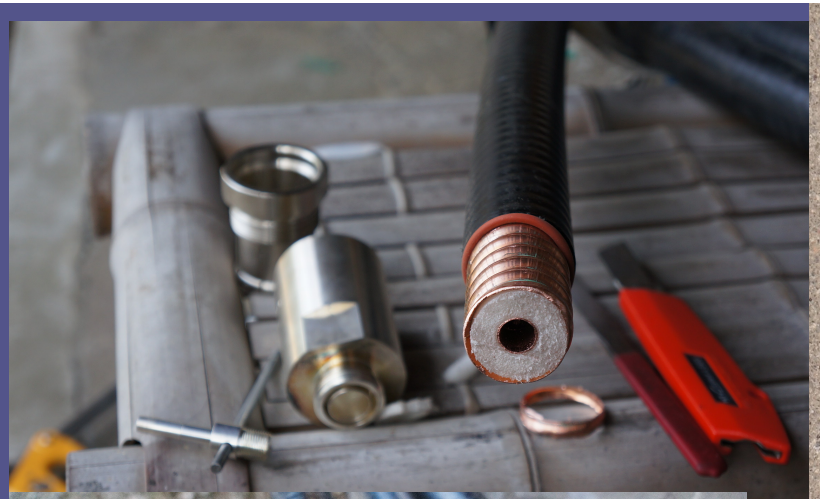
All were stollen later

Hard line

needs

a hard work.

This coax contains water!



TVRO: Polar rotation

↓

Modification for AZ/EL control with OE5JFL/HB9DRI controller

Programmed Moon Tracking

DRIAC G-II

TNX to:
OE5JFL/HB9DRI

EME with 4.4m TVRO

G=33 dBi, HBW=3.8°

1 MW eirp @1296 MHz

International EME Contest

In recognition of achieving a winning score by working fellow amateurs around the world, using the moon as a passive reflector, on designated A[illegible]quencies above 50 MHz during the contest period.

This award is presente[illegible]

JH1KRC

(Ops: JE1OYE, JH1KRC)

Score: 104,000

Multioperator, CW Only, 1.2 GHz

1st Place World

201[illegible]

Rick Roderick K5UR
President, ARRL

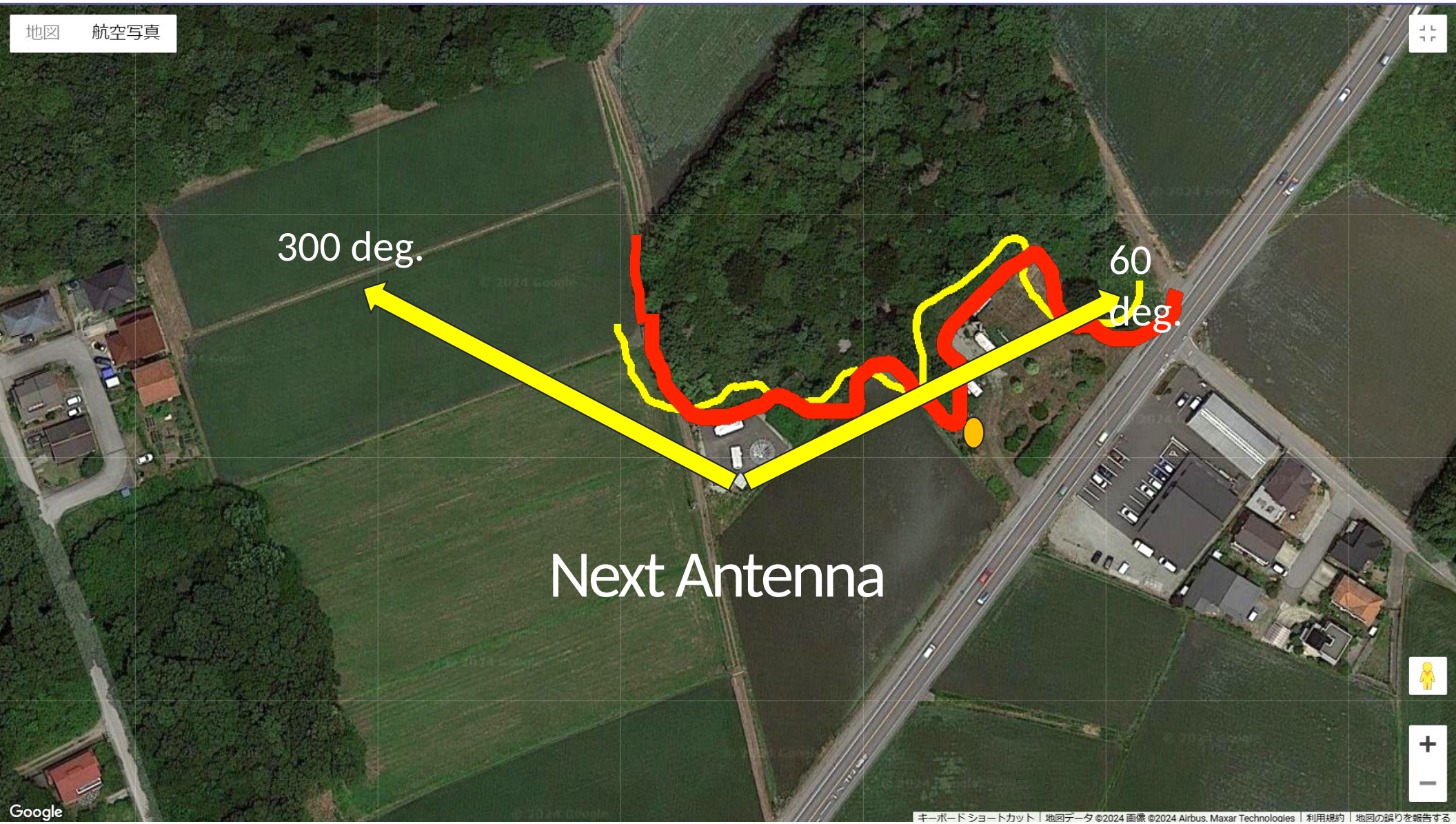
Bart Jahnke W9JJ
Contest Manager

EME

ARRL The national association for AMATEUR RADIO™

Over 150 initials were worked on 23 cm in CW.
Trees had grown up. No South America yet.

1996 2003 2013 2020 2024


地図
航空写真
300 deg.
60
deg.
Next Antenna
Google
キーボード ショートカット
地図データ ©2024 画像 ©2024 Airbus, Maxar Technologies
利用規約
地図の誤りを報告する

Visits to large antennas

HB9BBD 10-m

HB9Q 15-m

OE9ERC 8-m

OK1DFC 10-m.

K5SO 8.5-m

K5JL 6-m

Me

While in Japan...

JA8ERE 4.5-m

JA4BLC 6-m, 3-m, 2.4-m

JA6AHB 6-m

70 cm/23 cm DXCC

I haven't been but….

JA6DR (12m, 1980's)

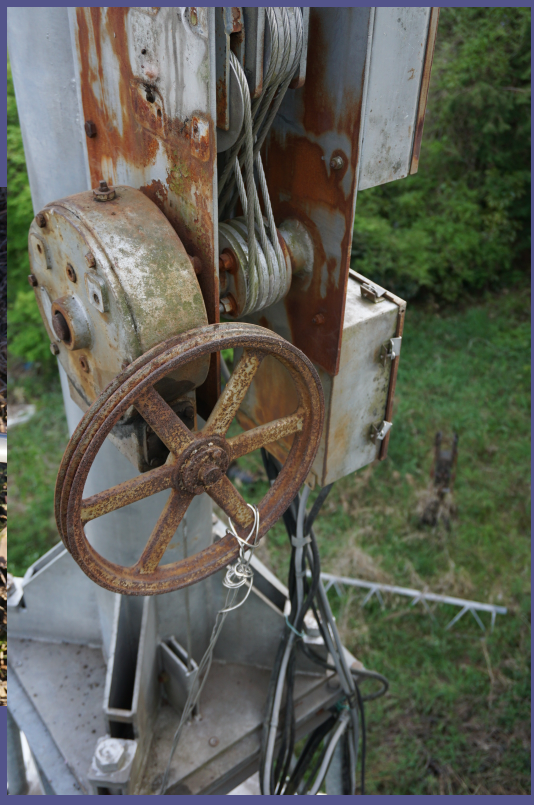
VK3UM 8.5-m

SM4IVE 13-m

What happens then?

Mongolia 2013

COVID-19 Pandemic (2020-2023) & Stay Home (or shack)



Repair TRI-EX Skyneedle.

Refurbish HF Yagis.

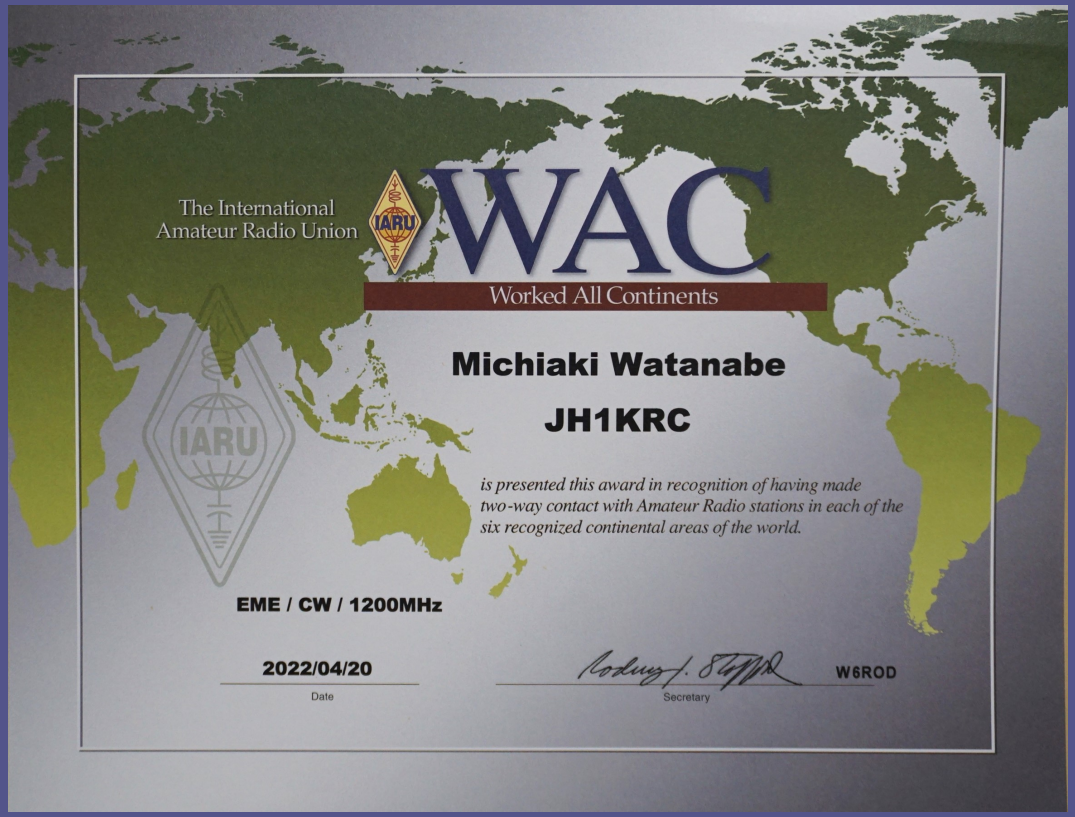
Repair motor cylinder.

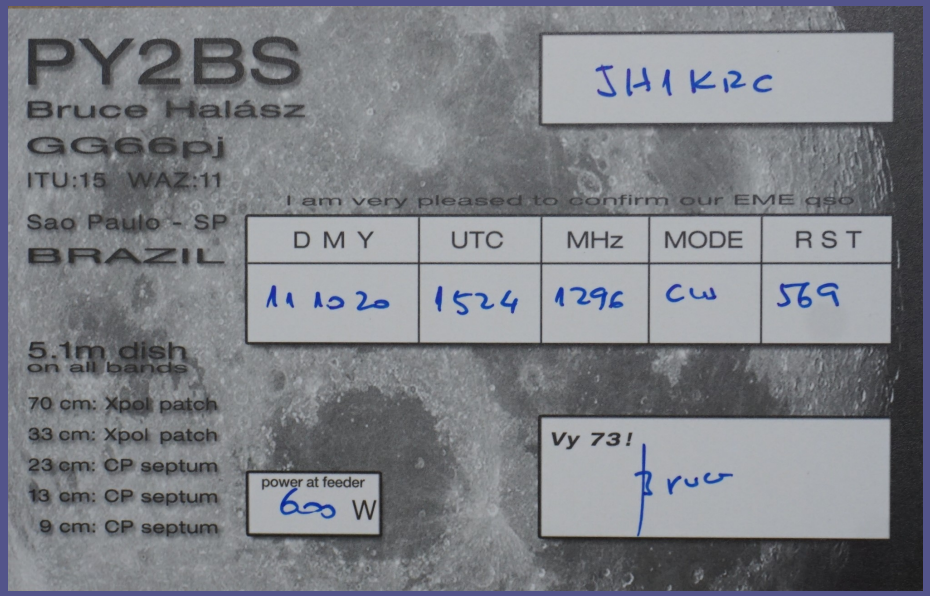
Work South America for WAC.

Enter HF DX Contests.

Take a computer to shack for contest logging.

I need PY/South America!

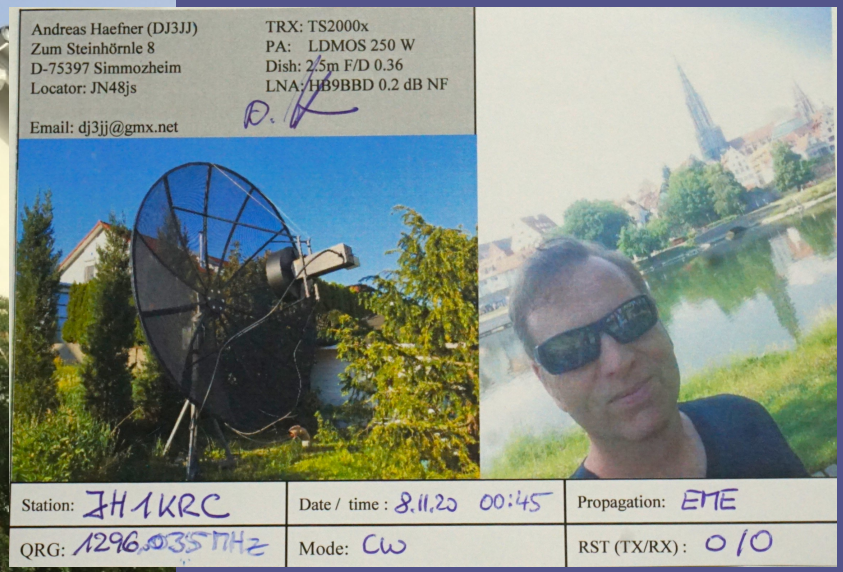




Soon after our QSO, PY2BS gave me his QSO directly. But caused by COVID-19 restriction, my QSL could not sent out for several months from the central post to Brazil .

Anyhow, I could get Worked All Continents (WAC) on 23 cm CW.

DJ3JJ Andreas requested me…at 23 deg.



Good success!!

Western window of 23 October, 2023 (ARRL EME Contest) .

Photos were taken at the same period.

What I want to be next is…

GODZILLA MINUS ONE

Official Trailer 2

GODZILLA OFFICIAL by TOHO

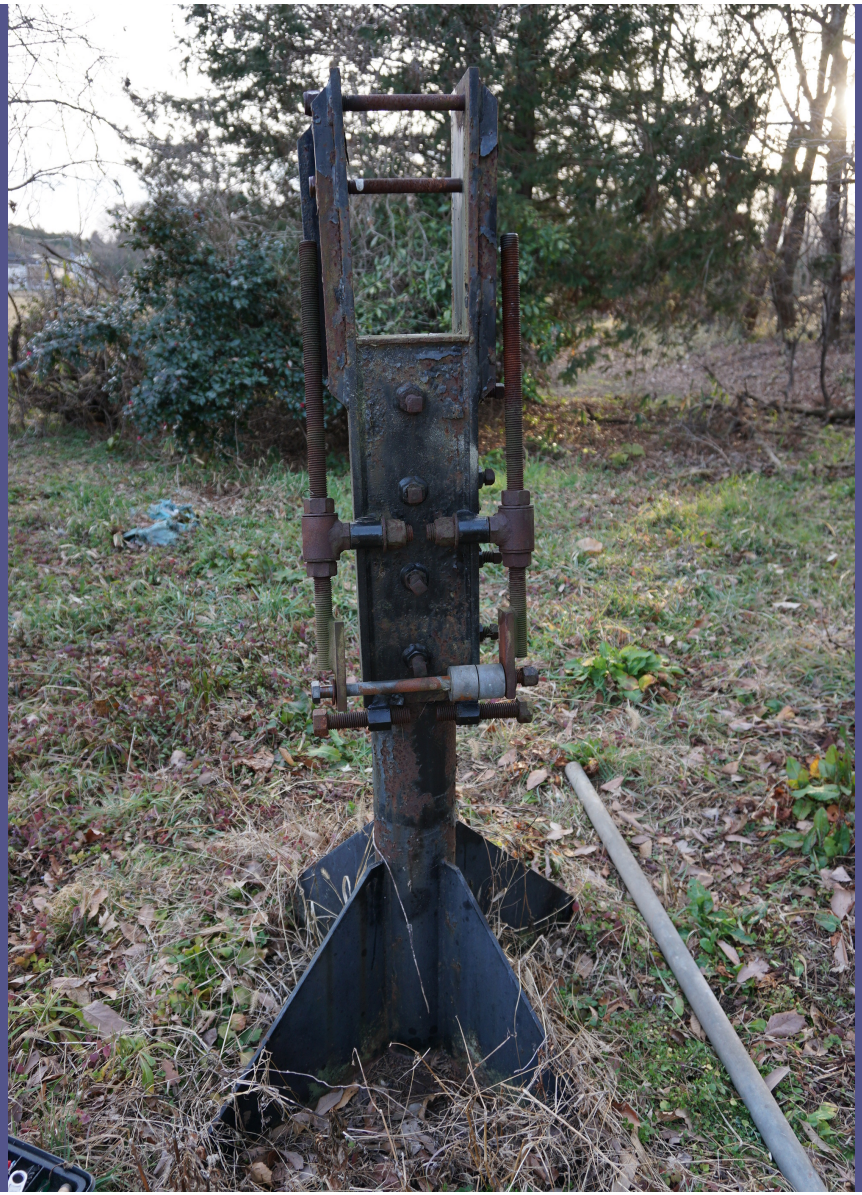
Excavation of “Fossils”

My son

Excavating “Fossils”

Hub ring

Baking paint



Spool

(Hub center)

My friend Doug, K6JEY

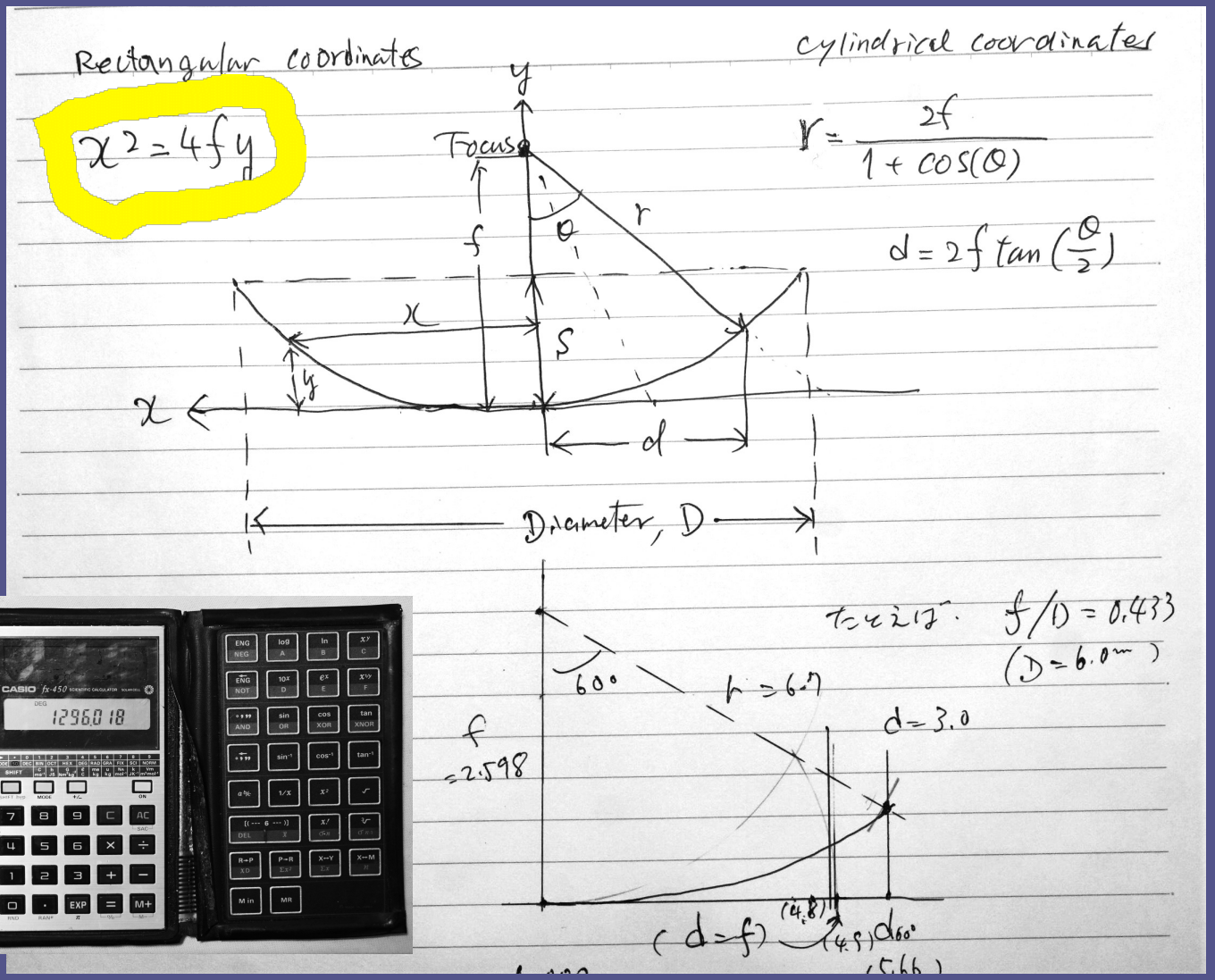
Focus

Calculation

with rectangular coordinates

or

with cylindrical coordinates.



Dimension measurement

Diameter (6-m)

Height (6.300 m dia.)

SPECIFICATIONS:

T20

Diameter:	**20.0′**	**(6.1m)**
Focal Length:	**108″**	**(274.3cm)**
F/D Ratio:	**.45**	
Gain at 4.2 GHZ:	**46.9 dBI**	
Gain at 12.2 GHZ:	**53.5 dBI**	
Shipping Weight:	**3150 lbs.**	**(1429 kg)**
Crate Size: A:	**93″x50″x41″**	**(237x127x105cm)**
B:	**93″x34″x34″**	**(237x87x87cm)**

Focus

$x^2 = 4fy$

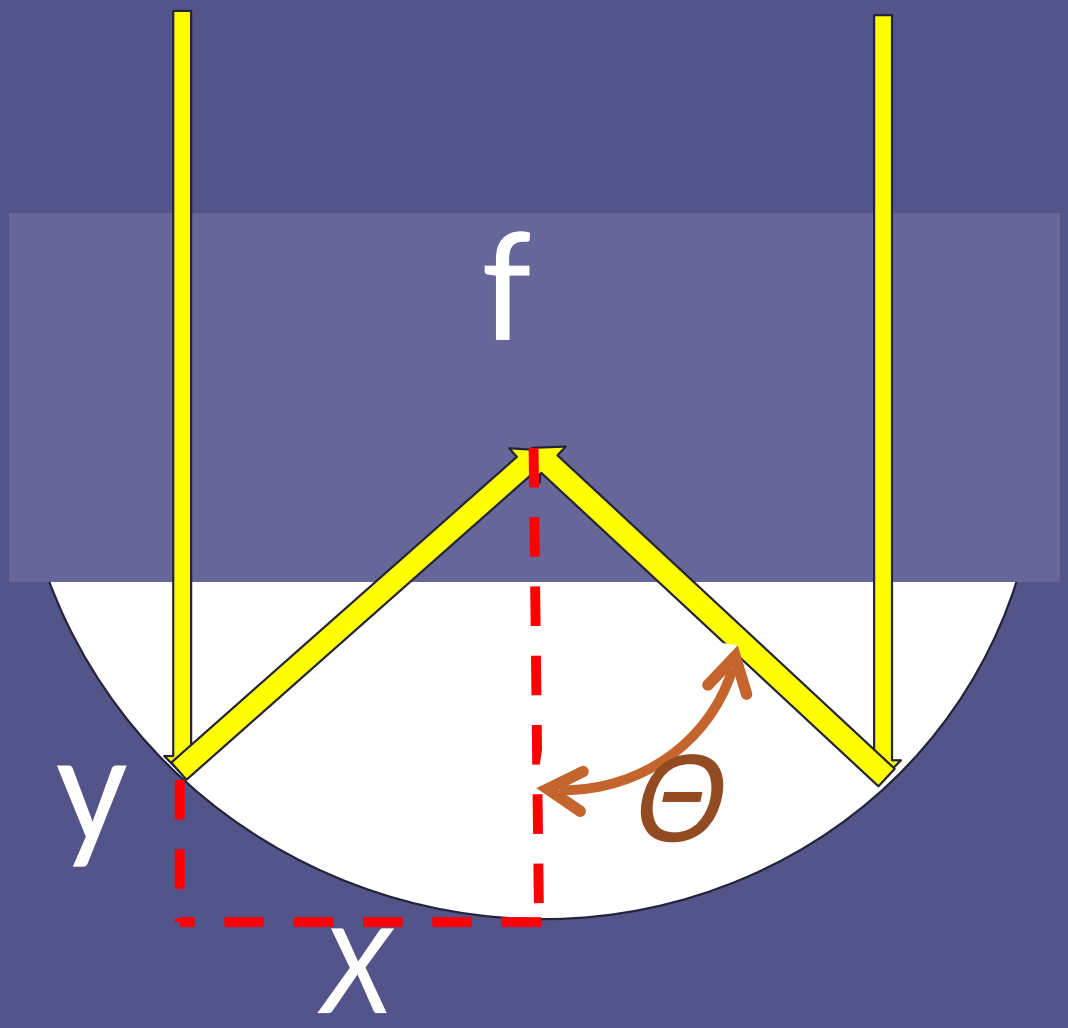
As:

x=6.30/2

y=0.894

then

f=2.775 (m)



Antenna Specification

Frequency =1296 MHz, $\lambda = 0.23$ (meters)

D: diameter (median mesh diameter)

G: gain, F: focus (2.775 meters)

HBW: half-power beam width

$$G = 6(D/\lambda)^2 \qquad HBW = 60(\lambda/D)$$

$$\text{Effective aperture} = 0.6(\pi D^2/4)$$

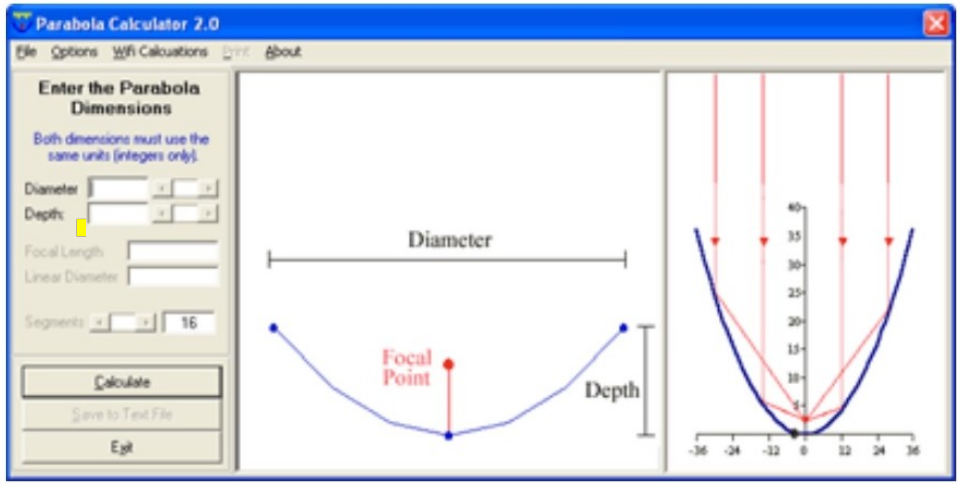
Antenna Specification

1) D: 6 meters
   G = 36.1 dBi, HBW = 2.3 degrees
   Aperture =16.96 m^2 F/D = 0.46

2) D: 7.65 meters (median mesh diameter)
   G = 38.2 dBi, HBW = 1.81 degrees
   Aperture = 27.6 m^2 F/D = 0.36

For windows, visit this site:

Parabola Calculator version 2.0



https://mscir.tripod.com/parabola/

Washing and Cleansig of Aluminium

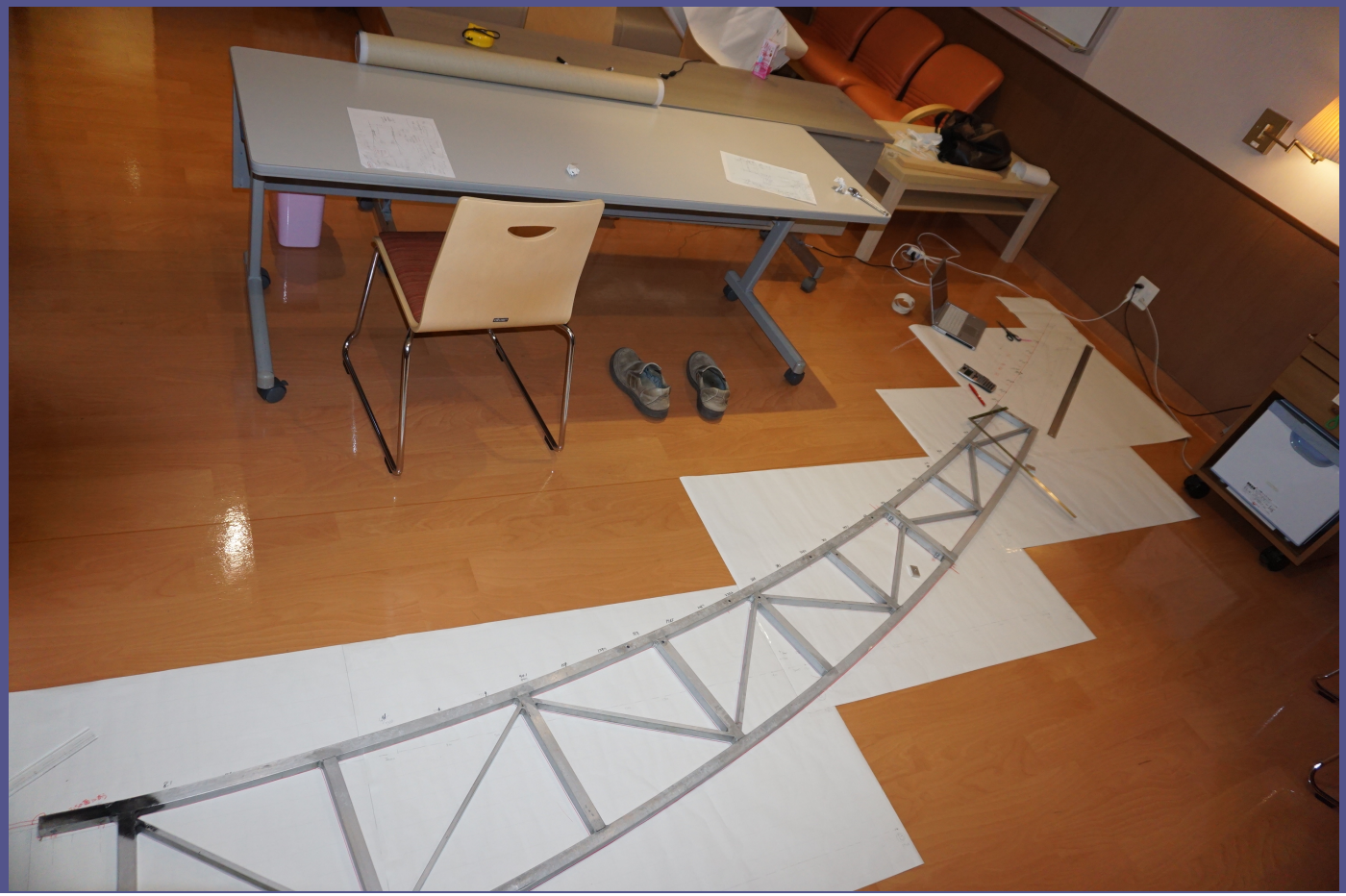
Noisy cleansing made it perfect.

Trace the trusses

Paper: 50x50 mm grids

Trace the trusses

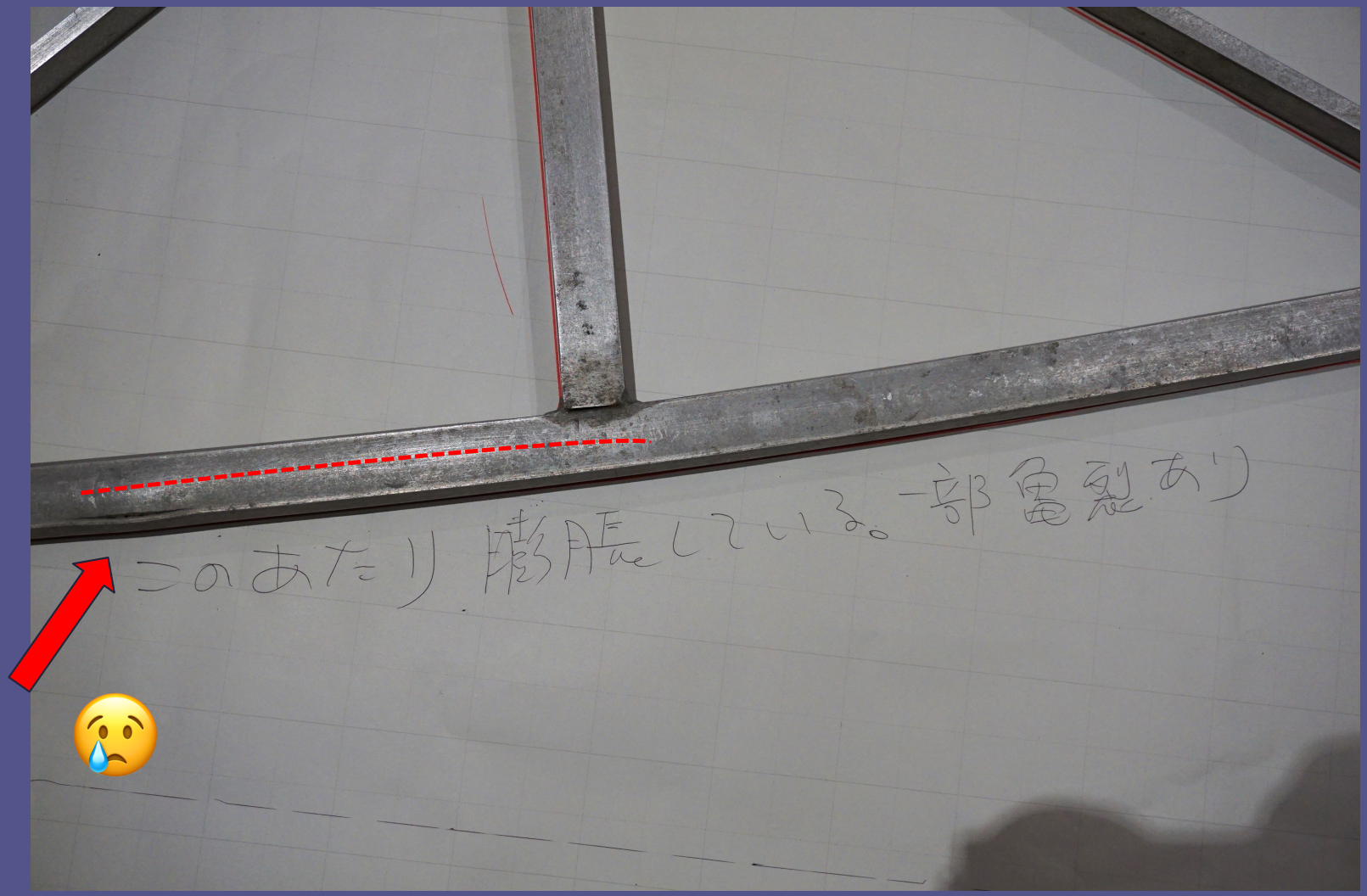
Reflector curve can be drawn in X-Y plot.

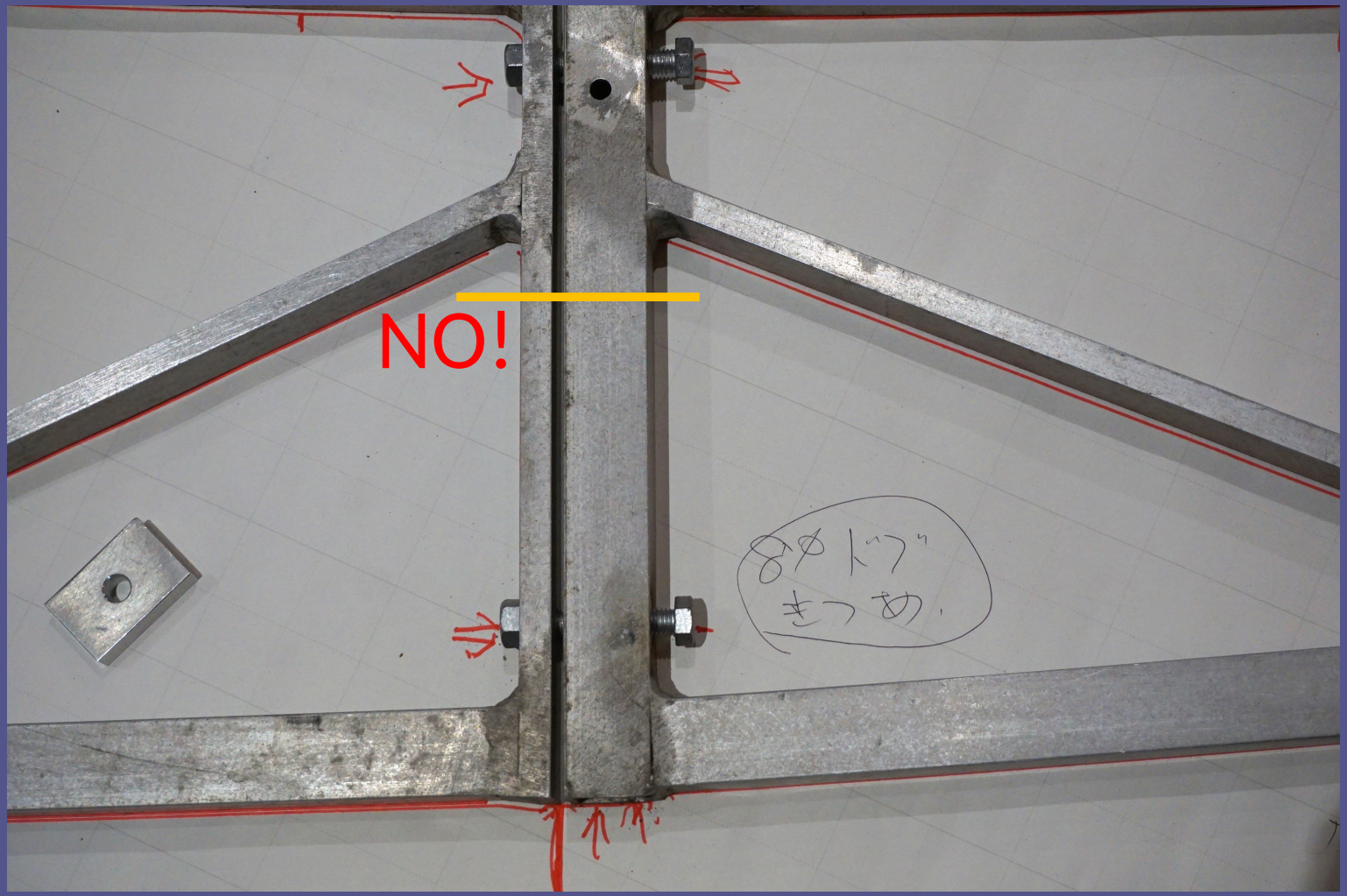


$Y=aX^2$

$a: 9.01 \times 10^{-5}$

Crack
and
swelling

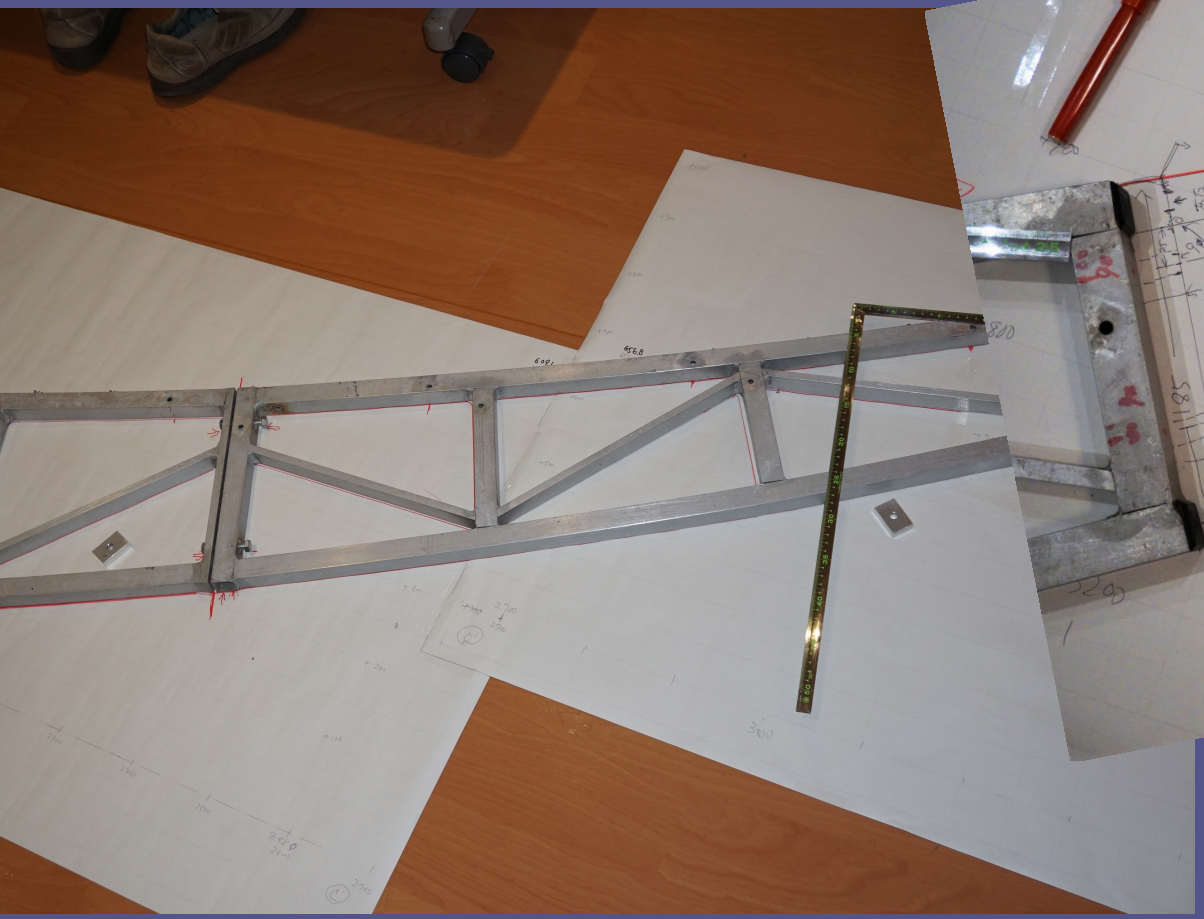


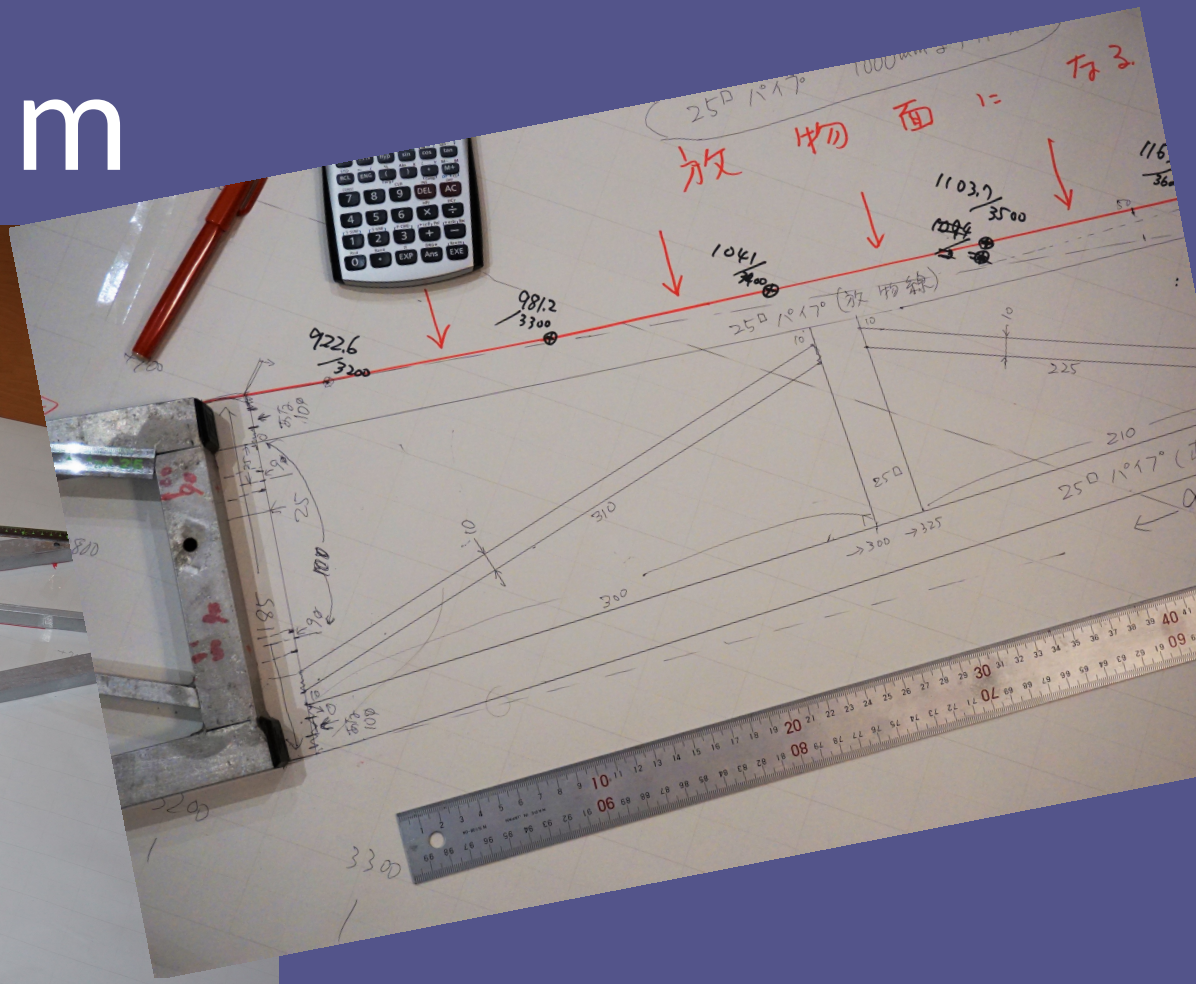


Bolts:

5/16” or 8.0 mm

Extention +1 m

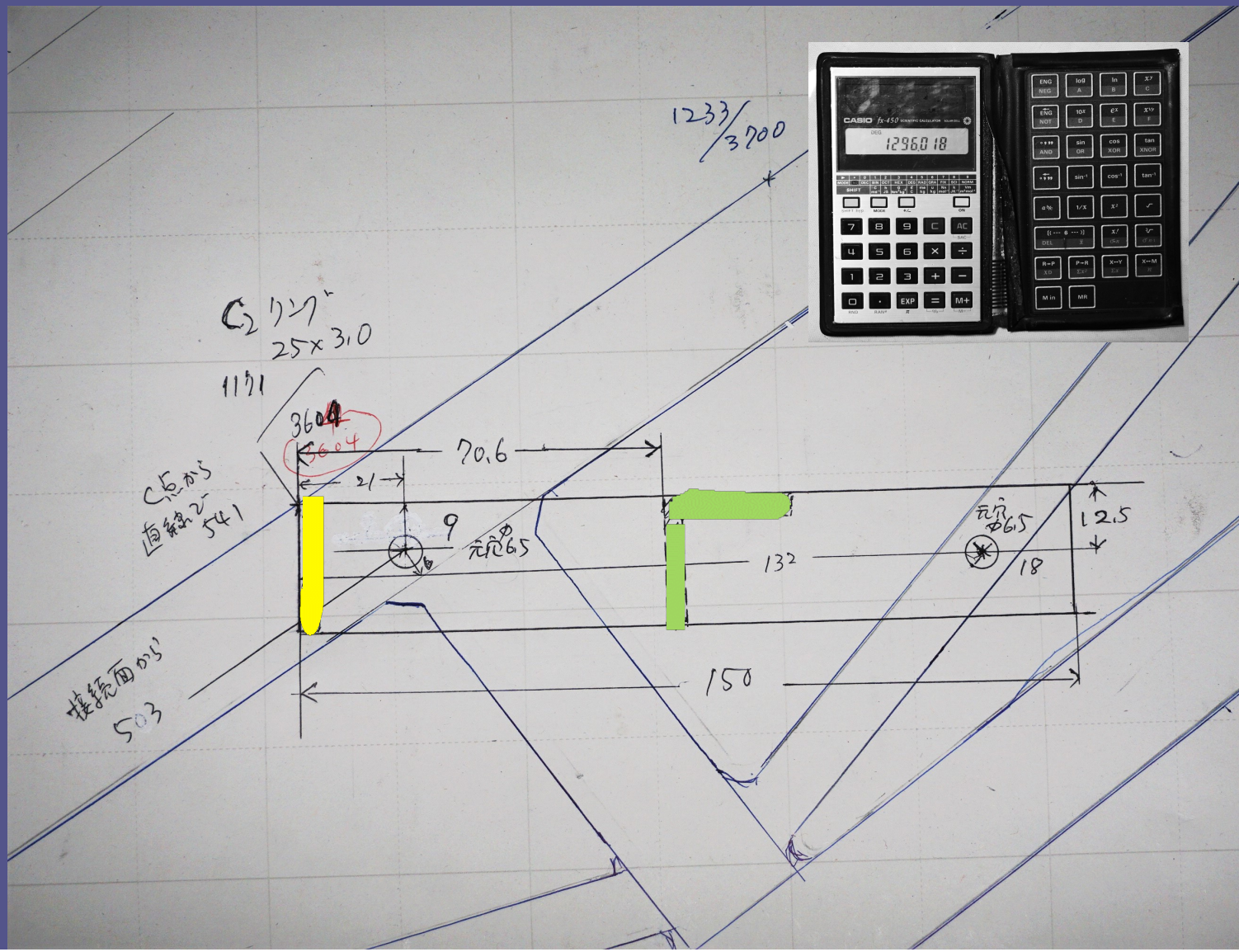




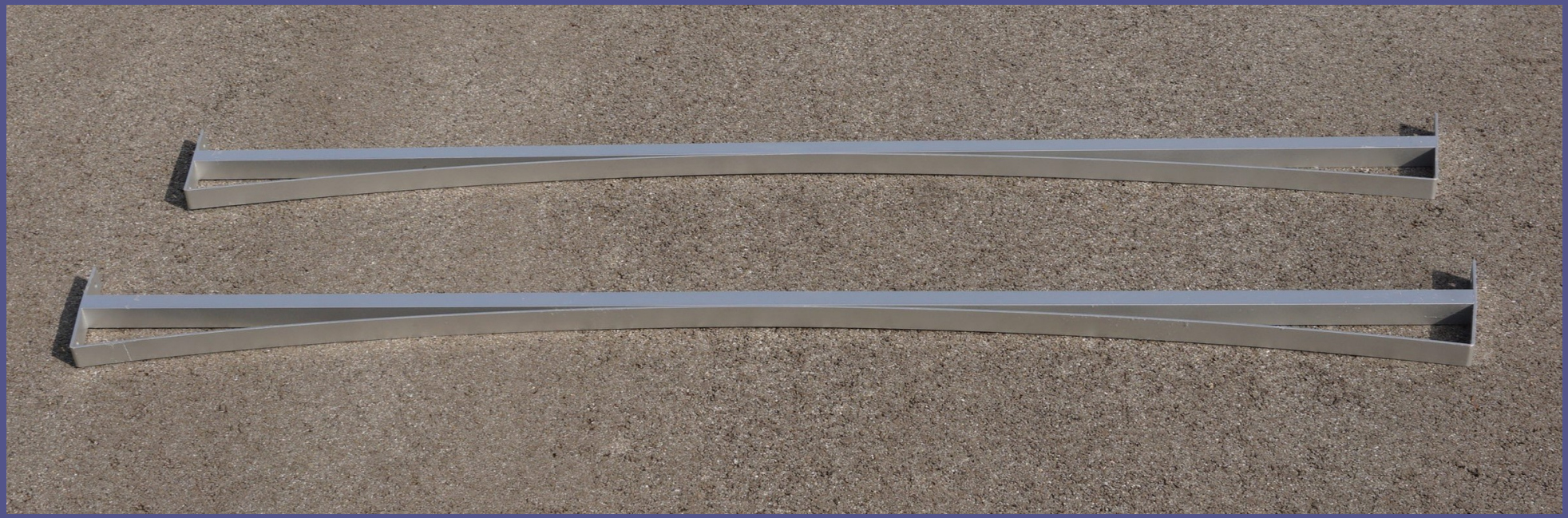
Mesh ring

Flat bar and L-angle are the Components.

Every mesh ring set has its own dimensions.



Mesh rings



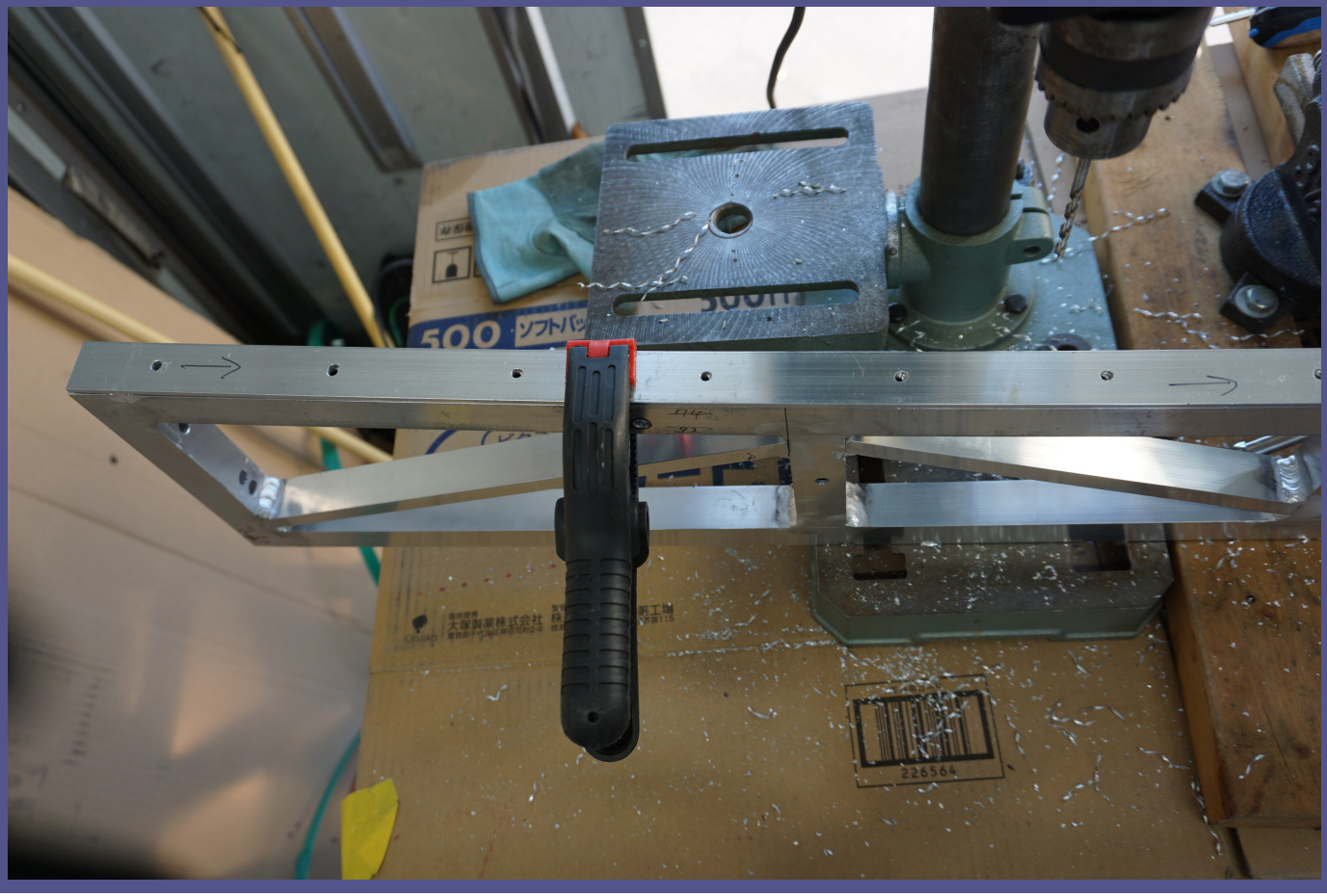
For the extended section, there are 3 types of mesh rings.

The longest one had to correct the dimension.

Mesh strips

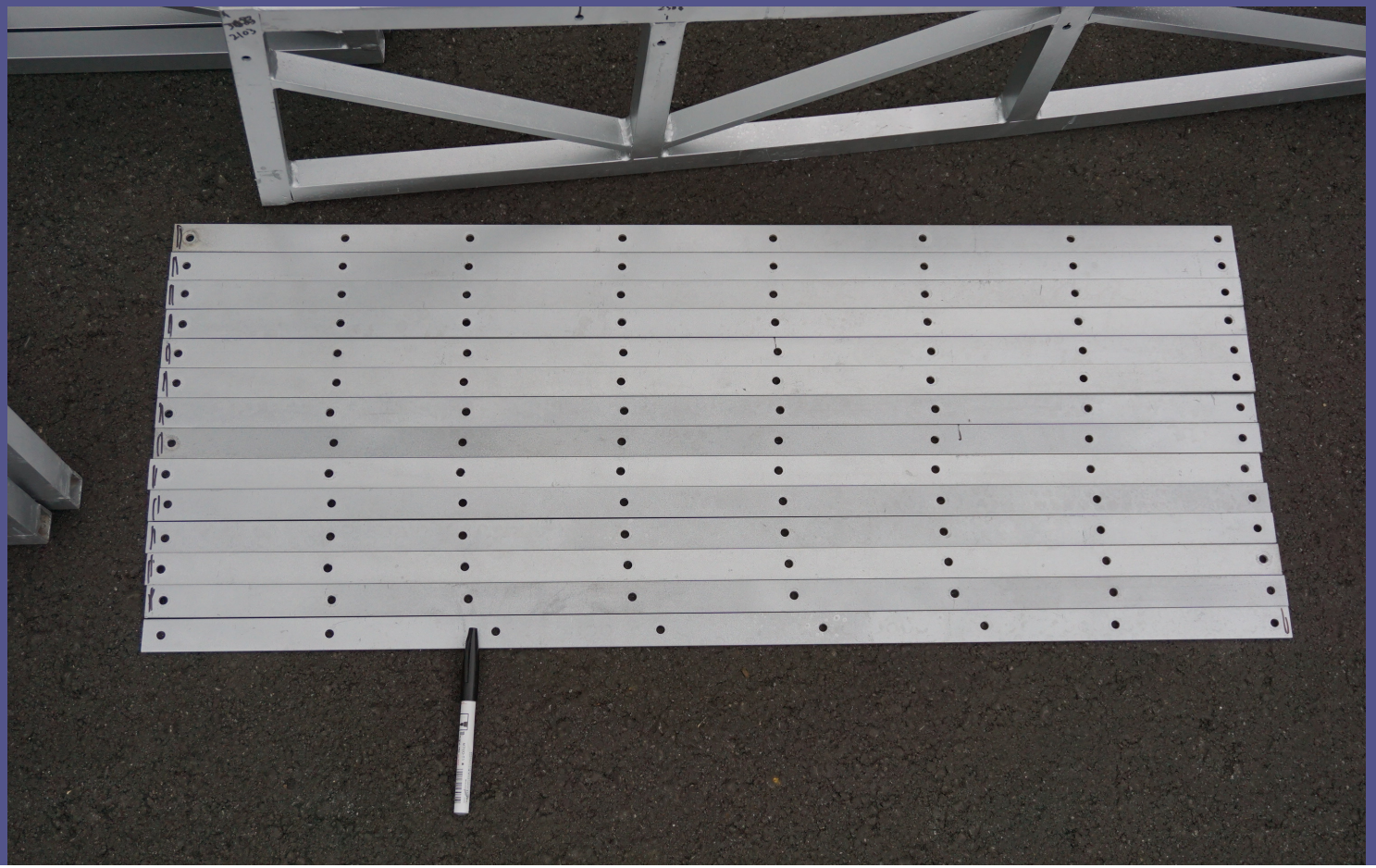
3 mm holes were made previously.

¼” drill screws would be easy to thread.



Mesh strips

Used before….

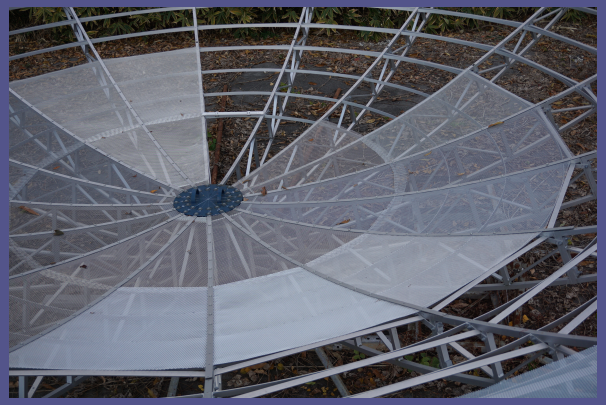


Drill

Applicator for perpendicular drilling,but it did not work well. Another bolt could not come into the hole.

A life does not go well as one expects....

Missing parts 1 & 2



* Aluminum mesh sheets
  3 shapes x 16 pcs. each

* Bolts/nuts/washers/springs
  Inch sized, hot-dip galvanized
  24 items, several to 400 pcs.

Original Parts List

REFLECTOR HARDWARE BOX FOR ORBITRON T-20 - CONT'D

32 - 5/16" Nyloc Nuts
64 - 5/16" Flat Washers
32 - 3/8" x 1" x 1-1/2" Aluminum Washers

Bag #10 - Trusses to Spool:
50 - 3/8" x 2-1/2" Hex Bolts Gr 5 (2 extra)
48 - 3/8" (Nylok) Nuts
96 - 3/8" Flat Washers
16 - 3/8" x 1" x 1" Aluminum Washers
16 - 3/8" x 1" x 4" Aluminum Washers

Bag #11 - Mesh Rings to Trusses:
250 - 1/4" x 1-3/4" Hex Bolts (16 extra)
224 - 1/4" Nylok Nuts
448 - 1/4" Flat Washers

Bag #12 - Mesh Strips to Trusses:
460 - 1/4" x 1" Tek Screws (54 extra)
1 - 3/8" Magnetic Tek Socket

Bag #13 - Quad Feed Support:
5 - 1/4" x 5" Round Head Bolts
24 - 1/4" x 2" Hex Bolts (4 extra)
20 - 1/4" Nylok Nuts
24 - 1/4" Washers (5/8" diameter)
20 - 1/4" Washers (3/4" diameter)
12 - 1/4" Hex Nuts (4 extra)

Bag #14 - Quad Leg Brackets:
4 - 1-1/2" x 1-5/16" Channels 4" long

Bag #15 - Mesh Attachment:
1750 - Mesh Clips

Assembled on Elevation Rods:
4 - 1" Hex Nuts
4 - 1" Flat Washers

Extra Nuts and Hardware:
20 - 1/4" Nylok Nuts
40 - 1/4" Flat Washers
4 - 5/16" Nylok Nuts
8 - 5/16" Flat Washers
5 - 3/8" Nylok Nuts
10 - 3/8" Flat Washers
4 - 1/2" Nylok Nuts
8 - 1/2" Flat Washers
2 - 5/8" Nylok Nuts
4 - 5/8" Flat Washers
2 - 3/4" Nylok Nuts
4 - 3/4" Flat Washers

thread cutting screw
(type 25
Hex flange

(16) long mesh strip 1x
(16) short mesh strip 1x

M8
ワッシャ → 140
スプリング → 70
ナット → 70
(ボルト 35 → 12 ～ 変える)
ボルト必要 250

ネジNo1.com
michiantenna 2020

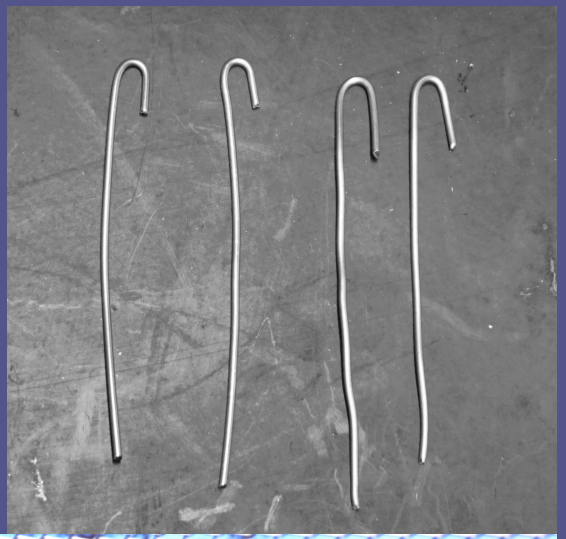
Missing parts 3

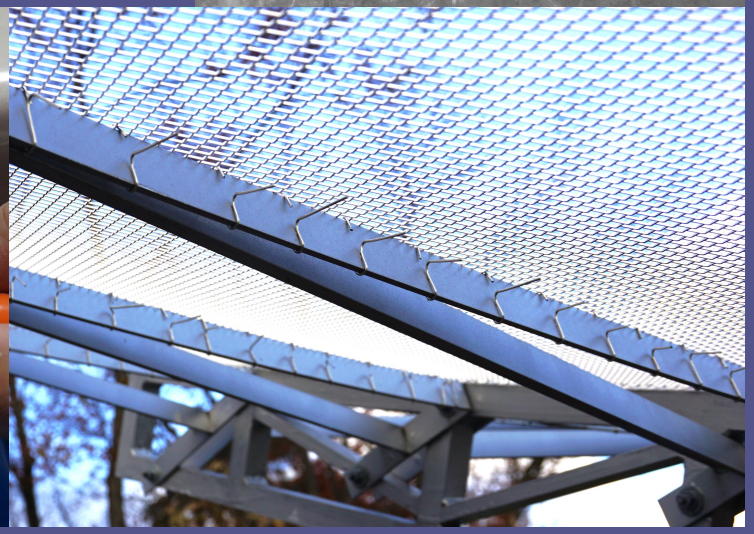
* Block or flat washers

Aluminum or steel, 5 types

Missing parts 4

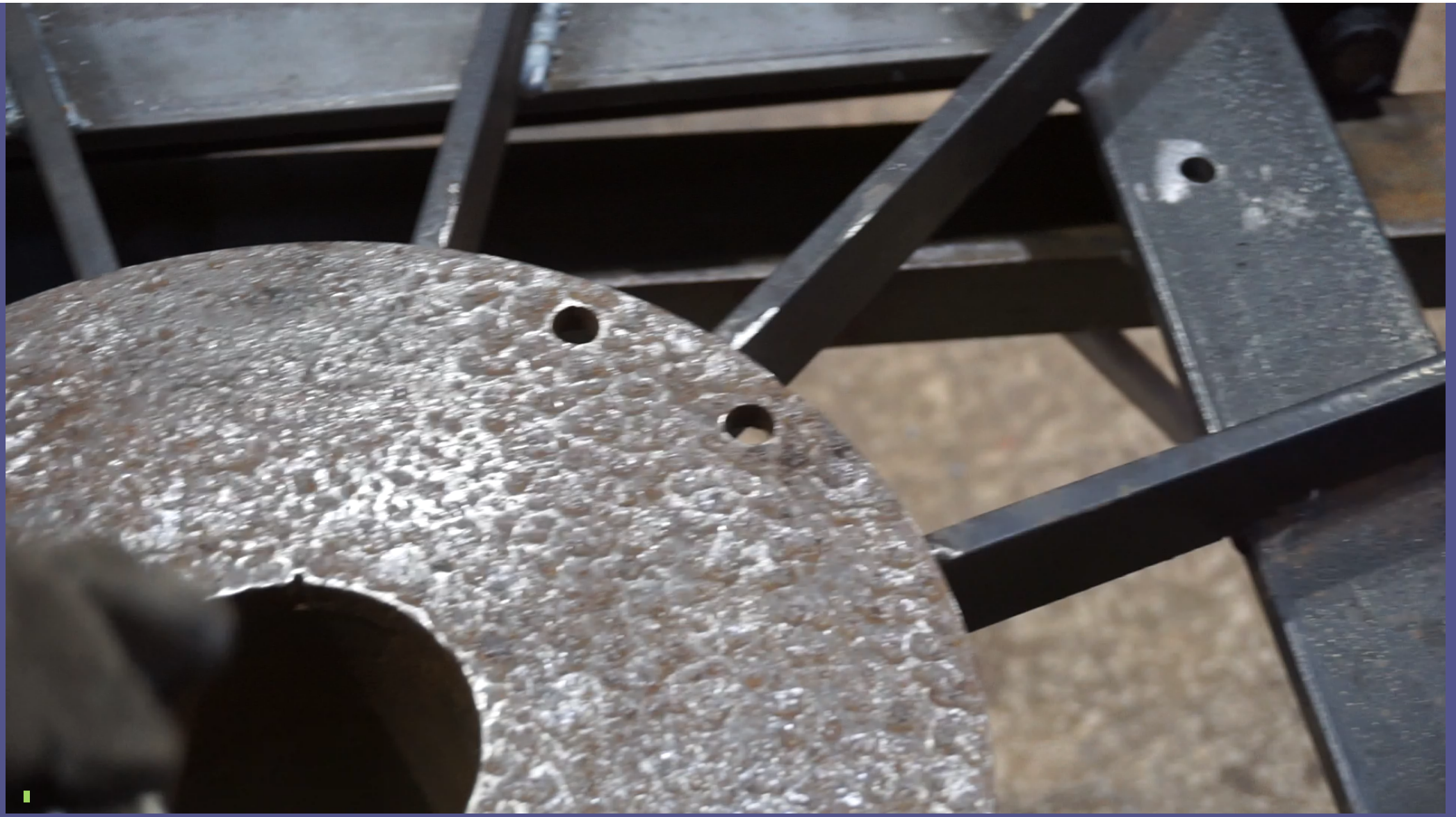
* Mesh clips, over4000 pcs.
  1x75 mm, stainless steel





Caution!

Stainless steel wire will fly.
Put it into a box and cut.



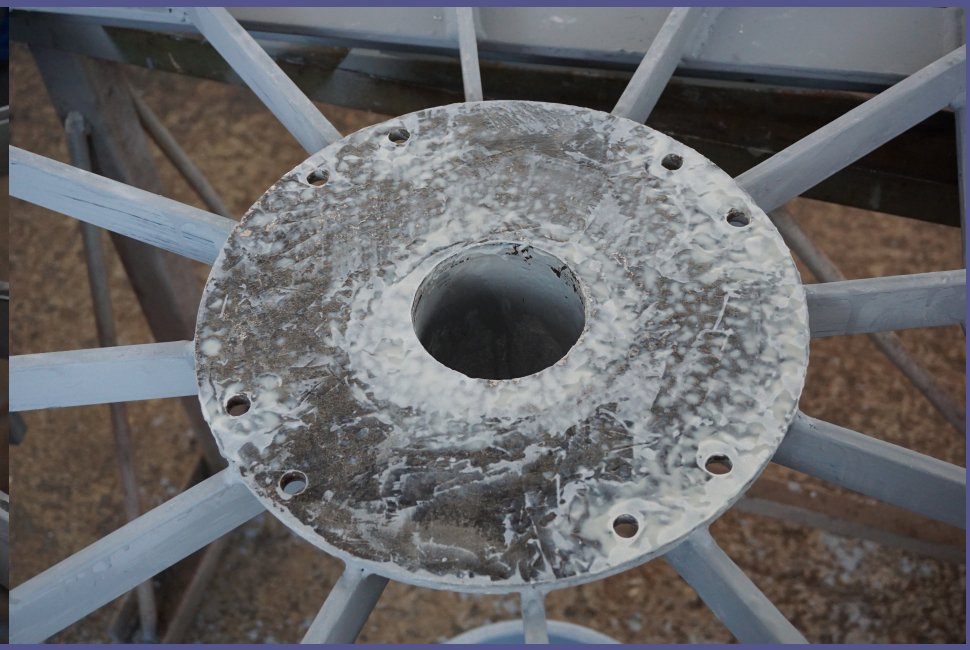
Measure the thickness

9.6 mm in average

Smoothen the surface

Dimples were filled with epoxy bond.

E250 A&B



The thickness was finally adjusted with a file.

Good flatness was achieved.
Epoxy bond is not very hard
but strong enough.

This pate becomes metal-hard. Filing may not be easy.

GENUS GM-8300 250 g/ \9k

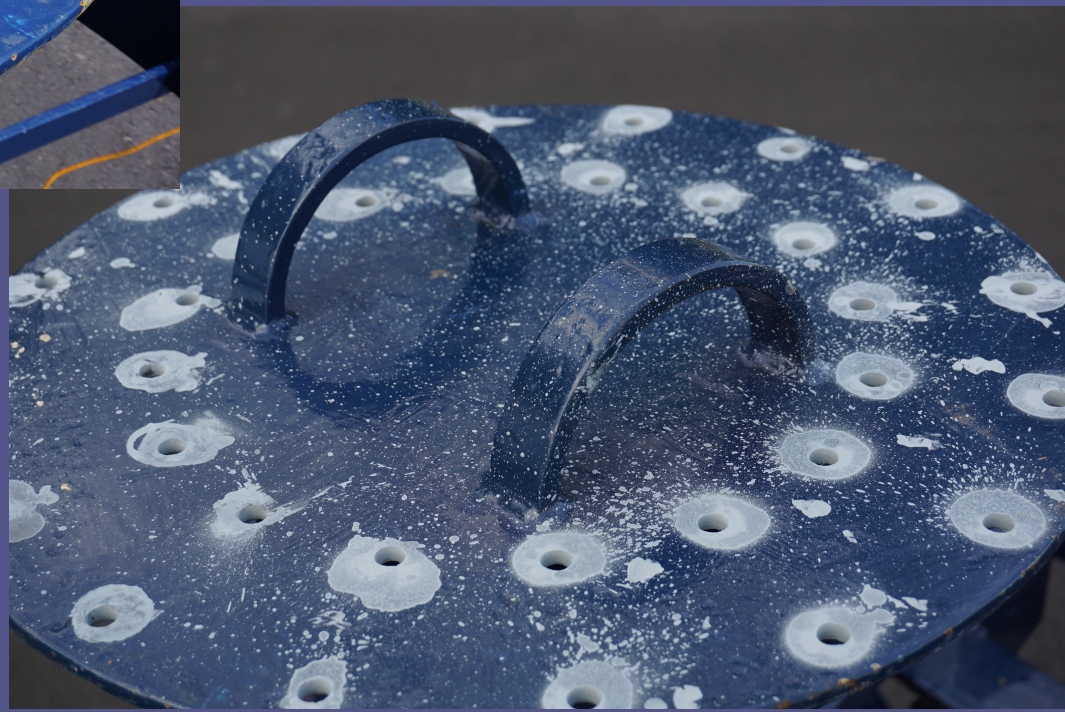
Anti-corrosion Painting

Painting in favorite color

Painting

In Antenna Plaza May 2021

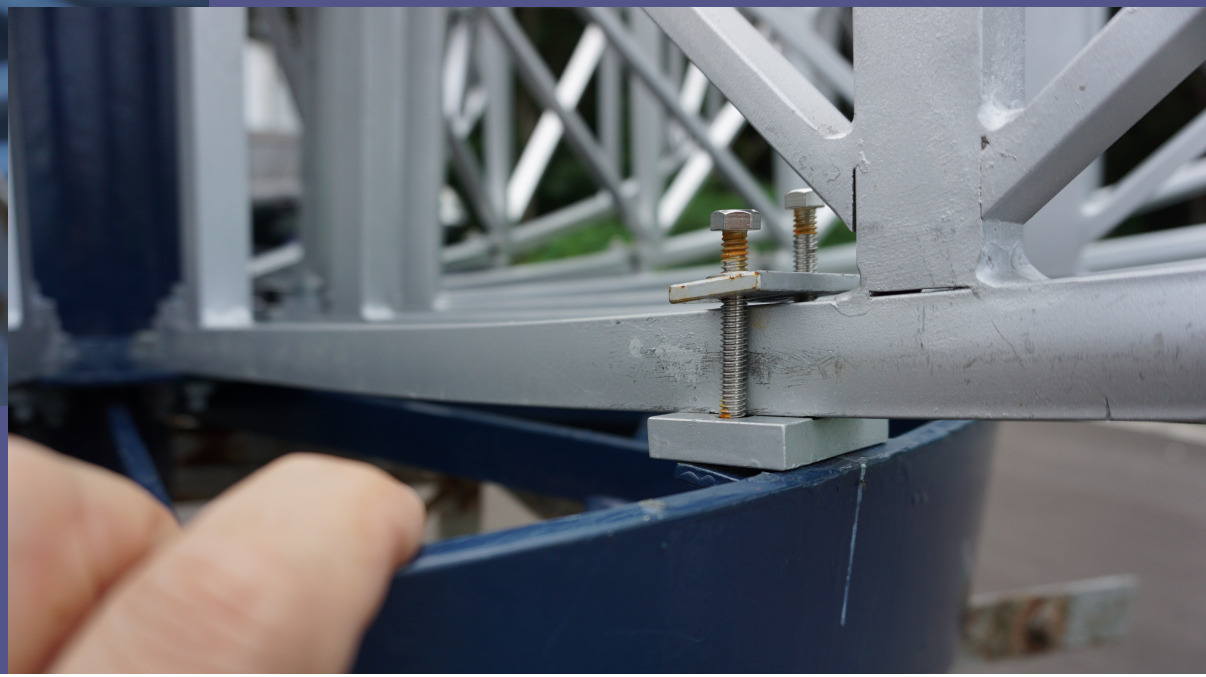
Corrosion occurred again
in a few days.
Another painting followed.



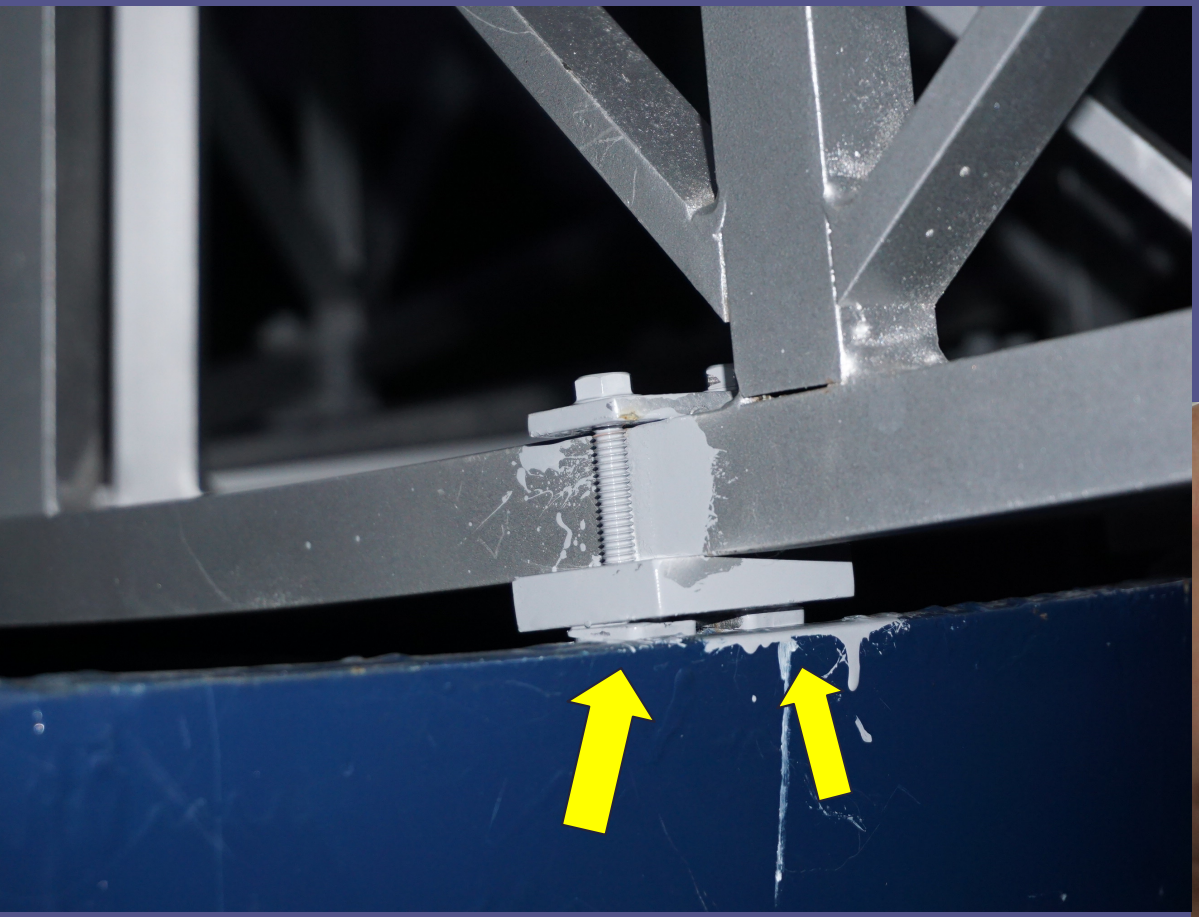
Spool was bolted onto the hub ring.

4-M section

Hub ring attachment



Sloping washer



Level inspection (4-m)

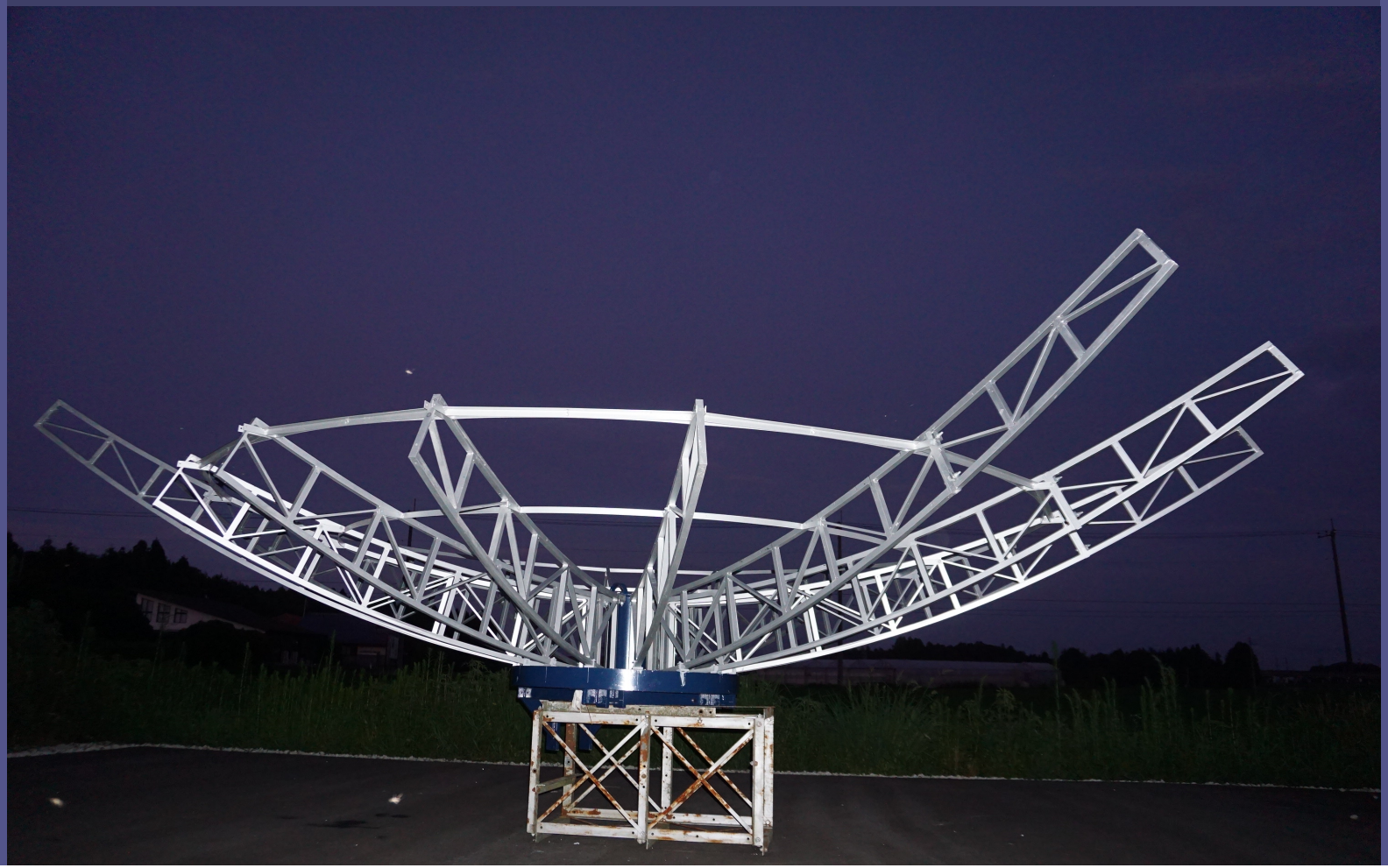
Inspector
JE1OYE

Outer mesh rings

The last one was too tight to insert….

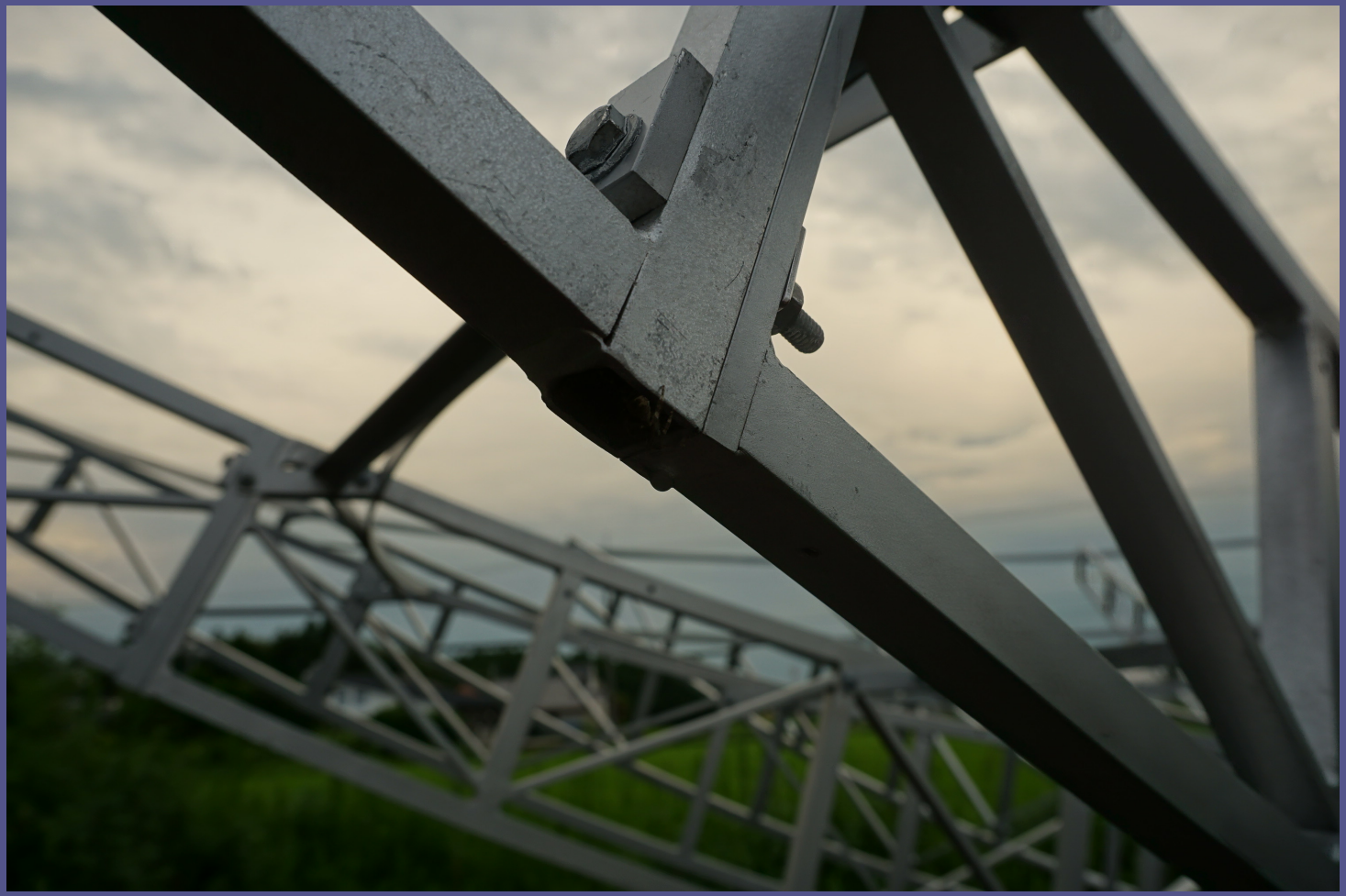
Alignment was perfect!

6-m section



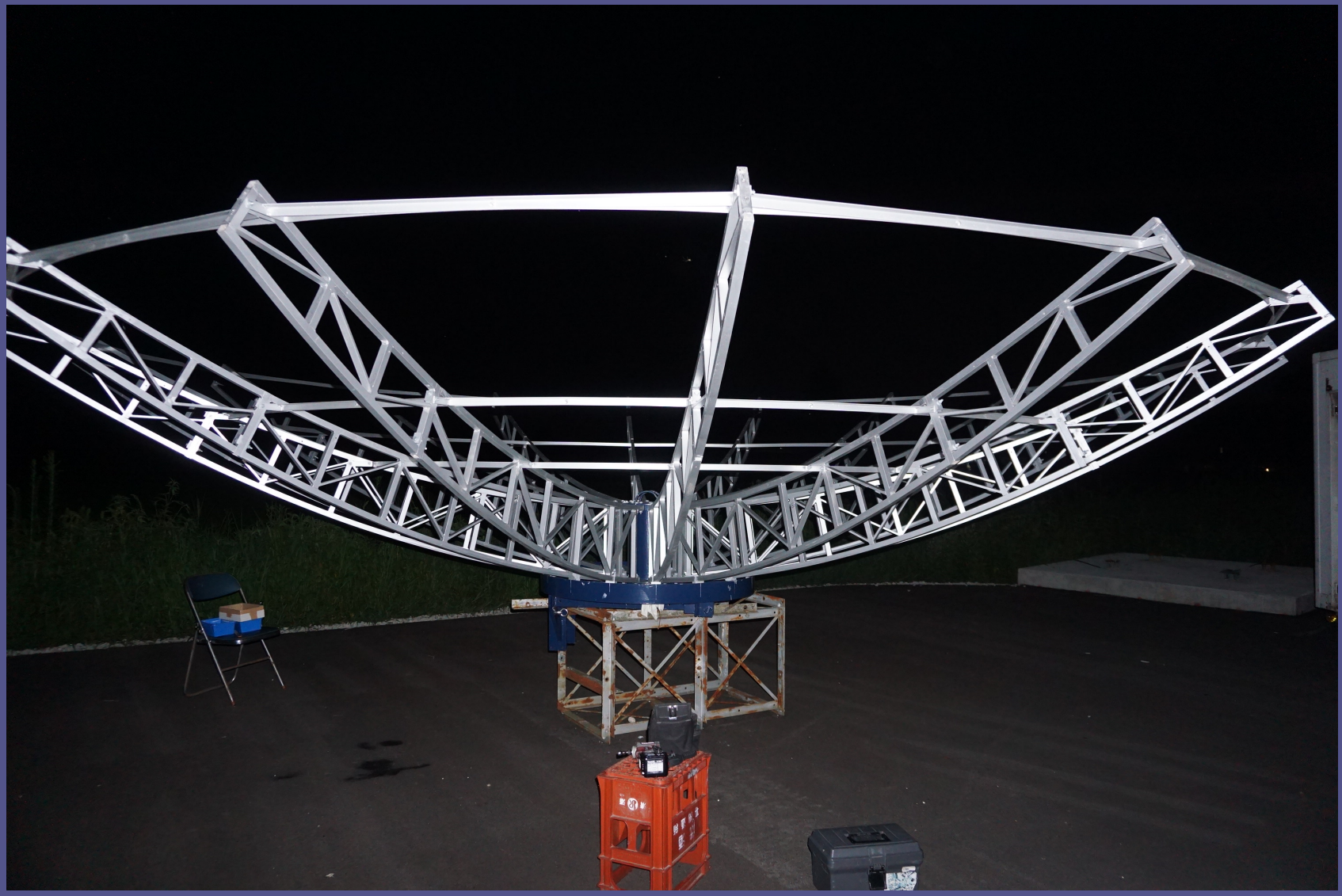
Impact screw driver
Strong graspers
Monkey spanners
are necessary .

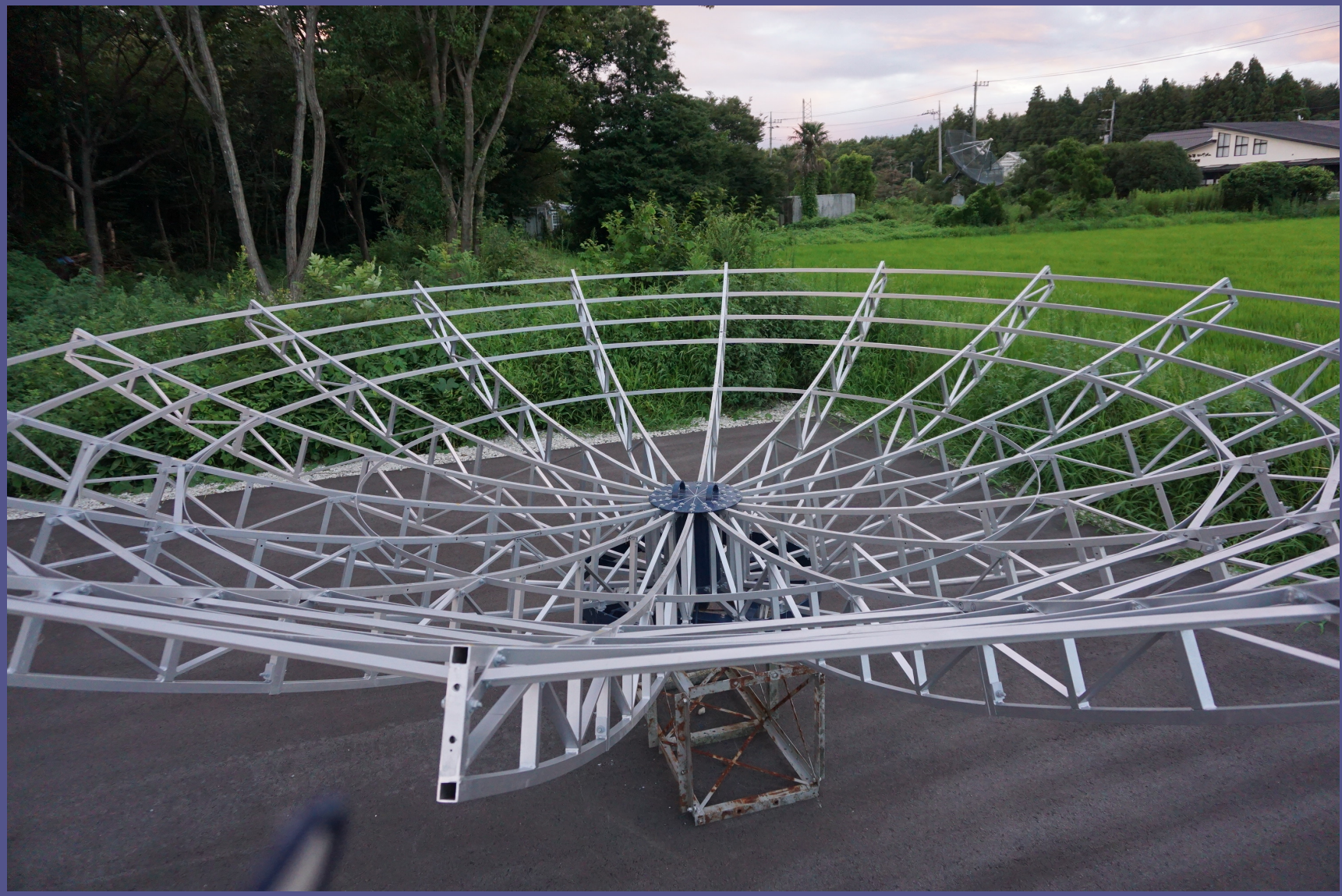
10
10
10



Block washer protects truss pilar.

He likes to make his
own MESH! No rain tonight.





6-m

July
2021

COSMOS

Parabolic flower

Everyone here likes PARABOLIC

Mesh
Reflector is cut out

Aluminum expanded mesh sheet

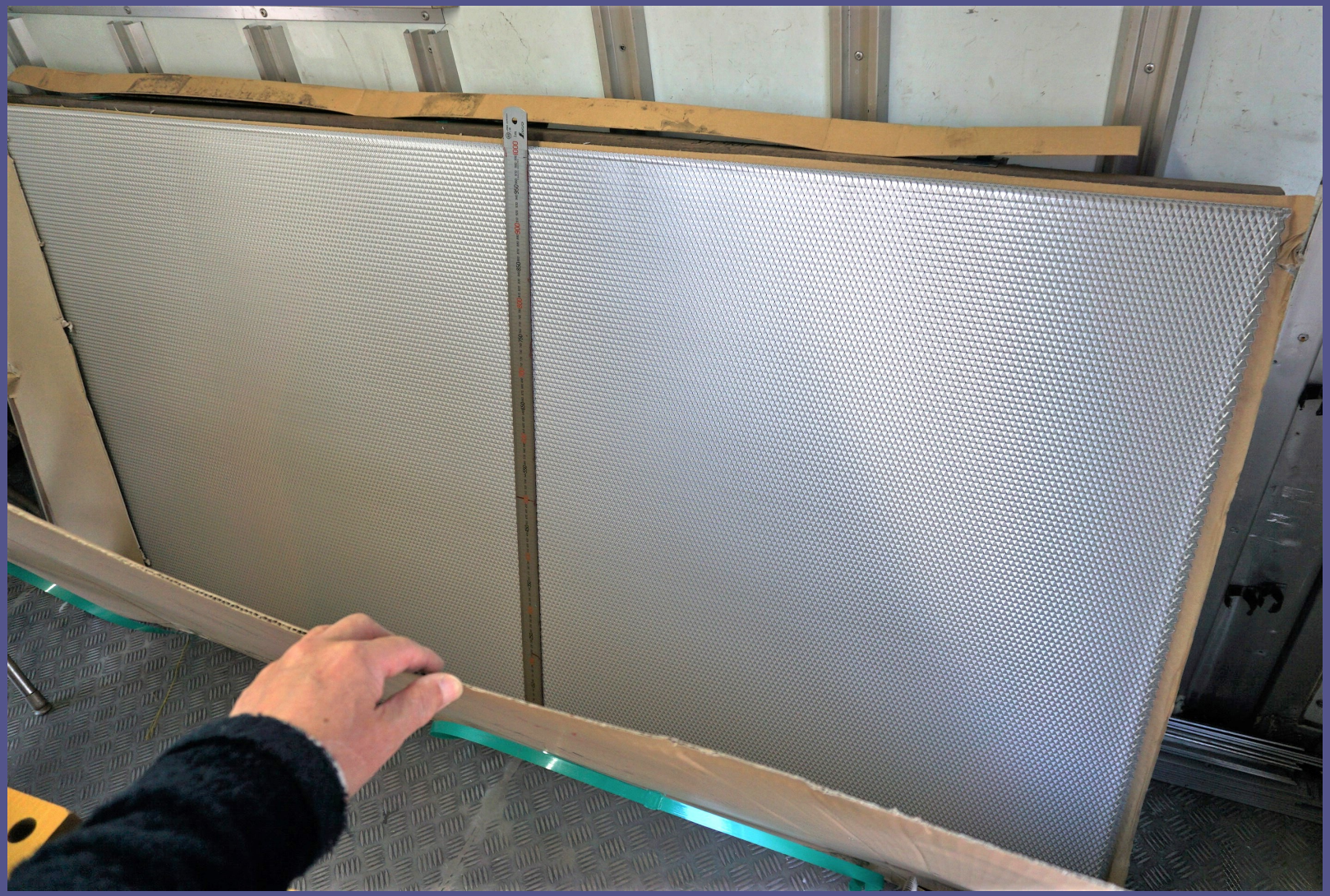
1000x2000 mm, 1.24 kg@

Mesh size: 7x14x0.8x1.0 mm

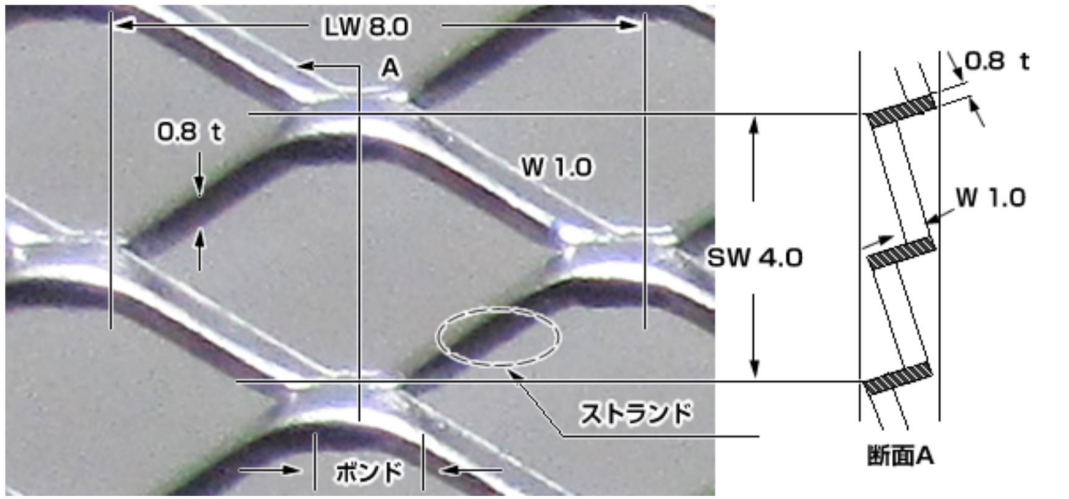
品番	メッシュ寸法(mm)		ストランド寸法(mm)		単位重量（kg/m²）	標準製品寸法1枚重量（kg）	形状	目方向
	SW	LW	T	W		L1000xS2000		
	3.0	4.6	0.5	0.7	0.64	1.27	菱形	
	3.1	6.0	0.5	0.7	0.62	1.23	菱形	
	4.0	8.0	0.5	0.8	0.55	1.09	菱形	
	4.0	8.0	0.8	1.0	1.09	2.18	菱形	
	7.0	14.0	0.5	1.0	0.39	0.78	菱形	
	7.0	14.0	0.8	1.0	0.62	1.24	菱形	
	7.0	14.0	1.0	1.0	0.78	1.55	菱形	
	10.0	20.0	0.8	1.0	0.44	0.87	菱形	
	10.0	20.0	1.0	1.0	0.55	1.09	菱形	タタミ
	14.0	25.0	0.8	1.0	0.31	0.62	菱形	
	16.0	32.0	1.5	1.5	0.77	1.53	菱形	

Aluminum Expanded metal sheets

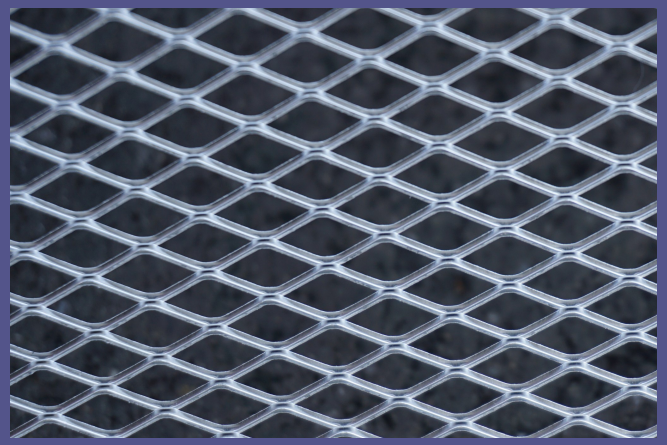
Suzuki Technos Co., Tokyo



LW 14 SW 7
W 1.0 T 0.8

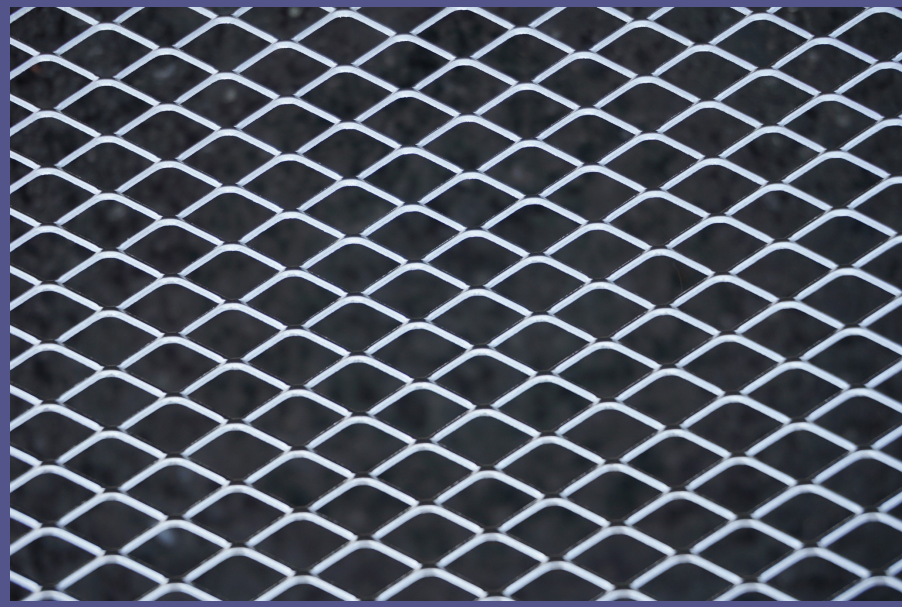


0.8T/W1.0×4.0/8.0
画像 5の8 (スライドショーを再生する)
CLOSE

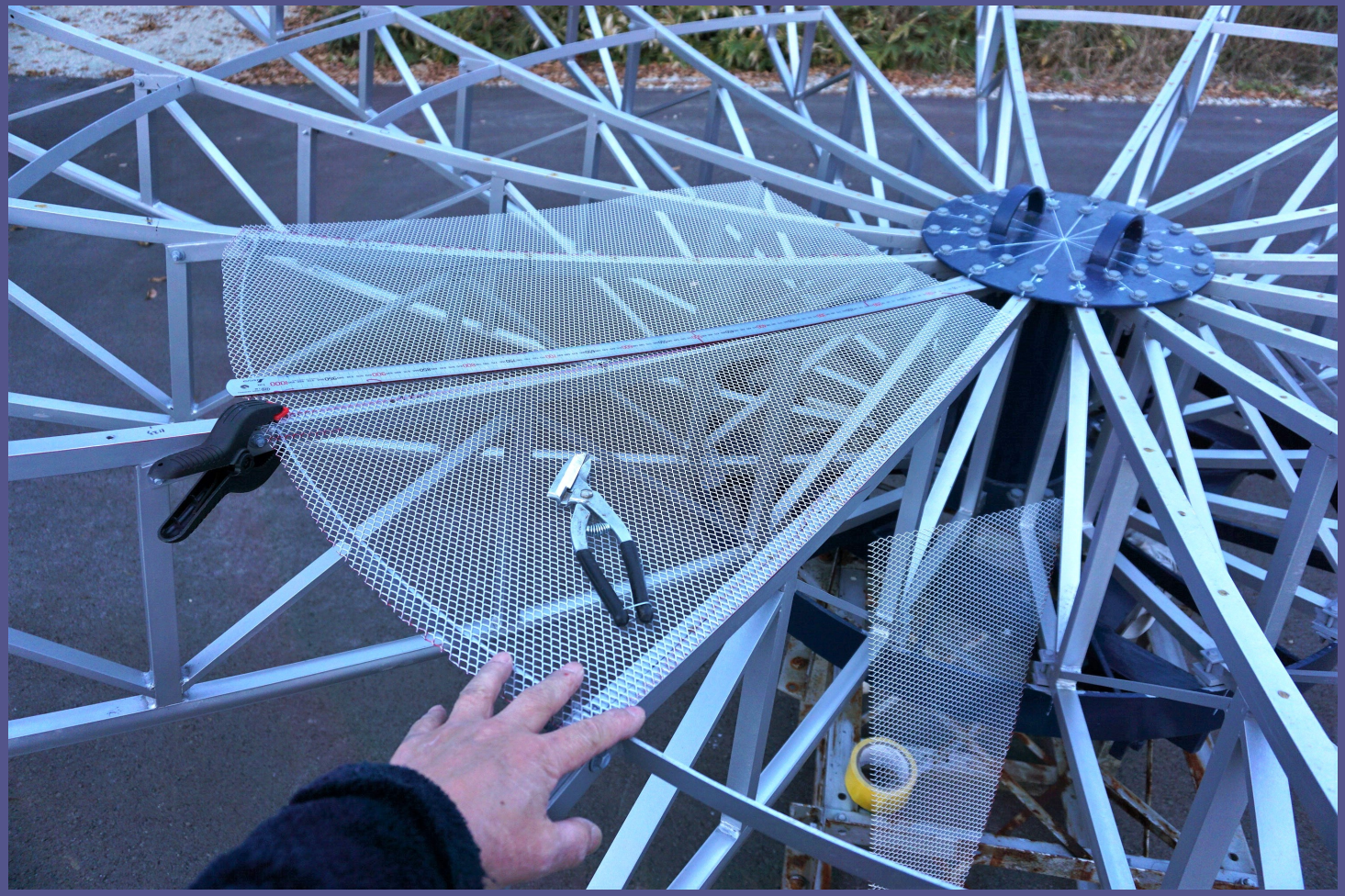


Front

Rear



Expanded metal sheet has its front or rear, and up or down.



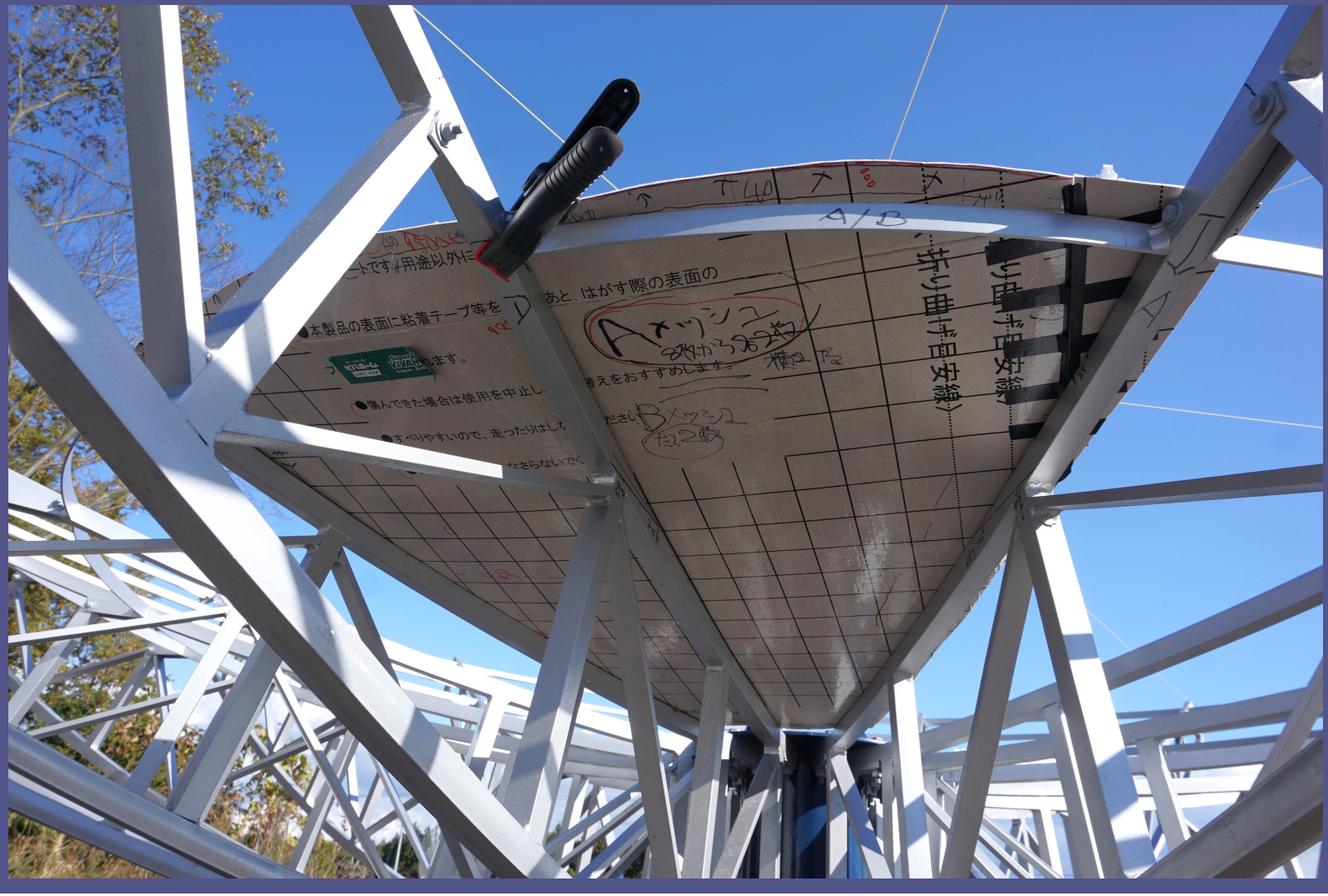
Trace directly.

Mesh A
size was
determined.

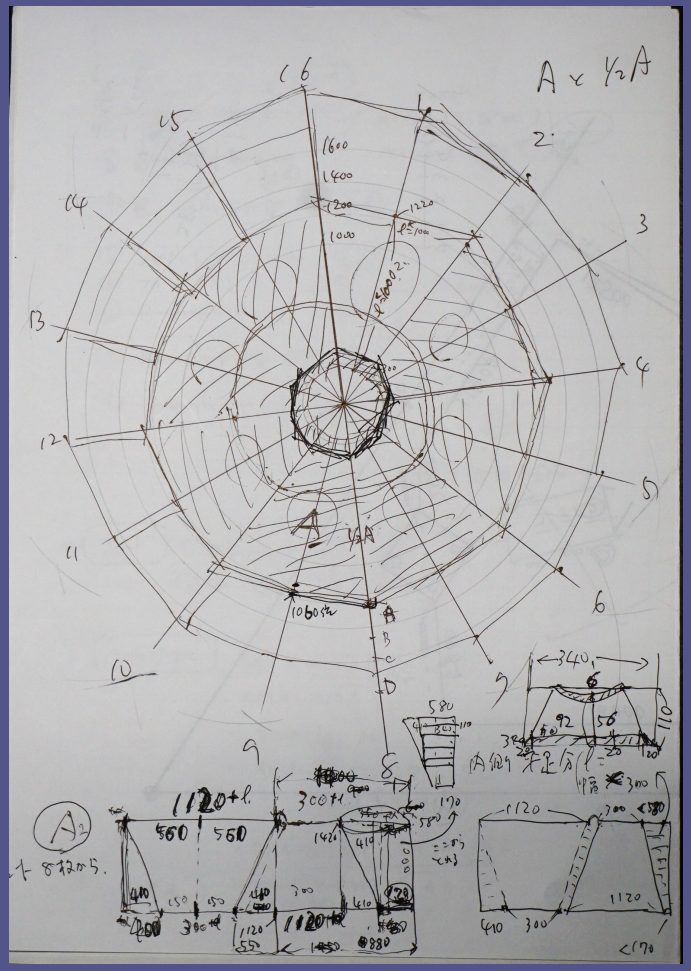
Trace

the mesh A

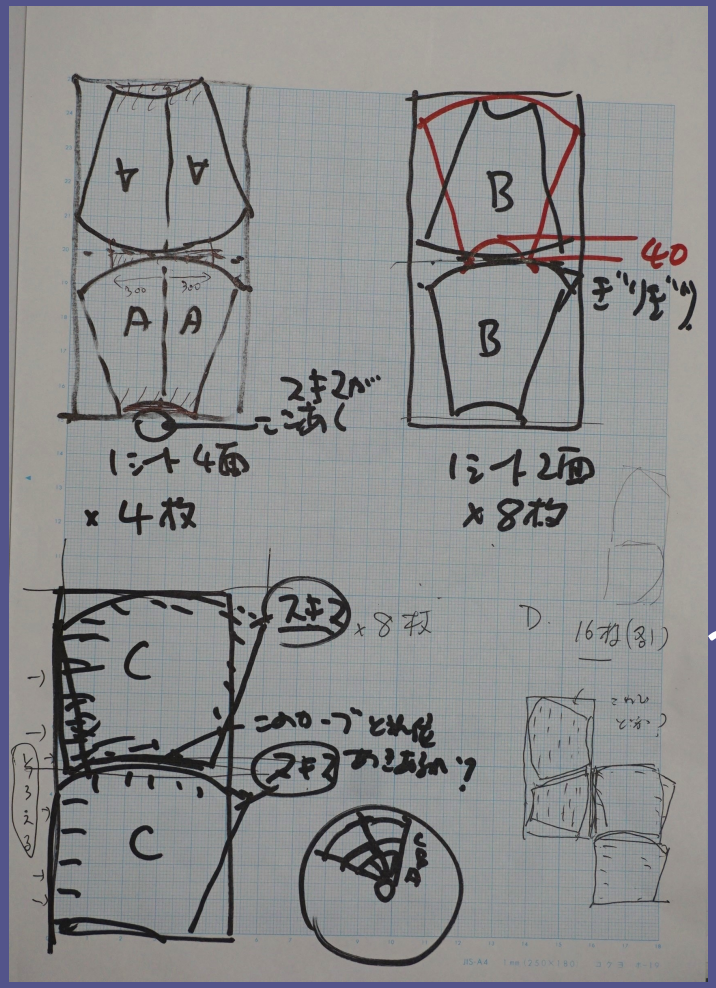
template



How to trim the mesh?



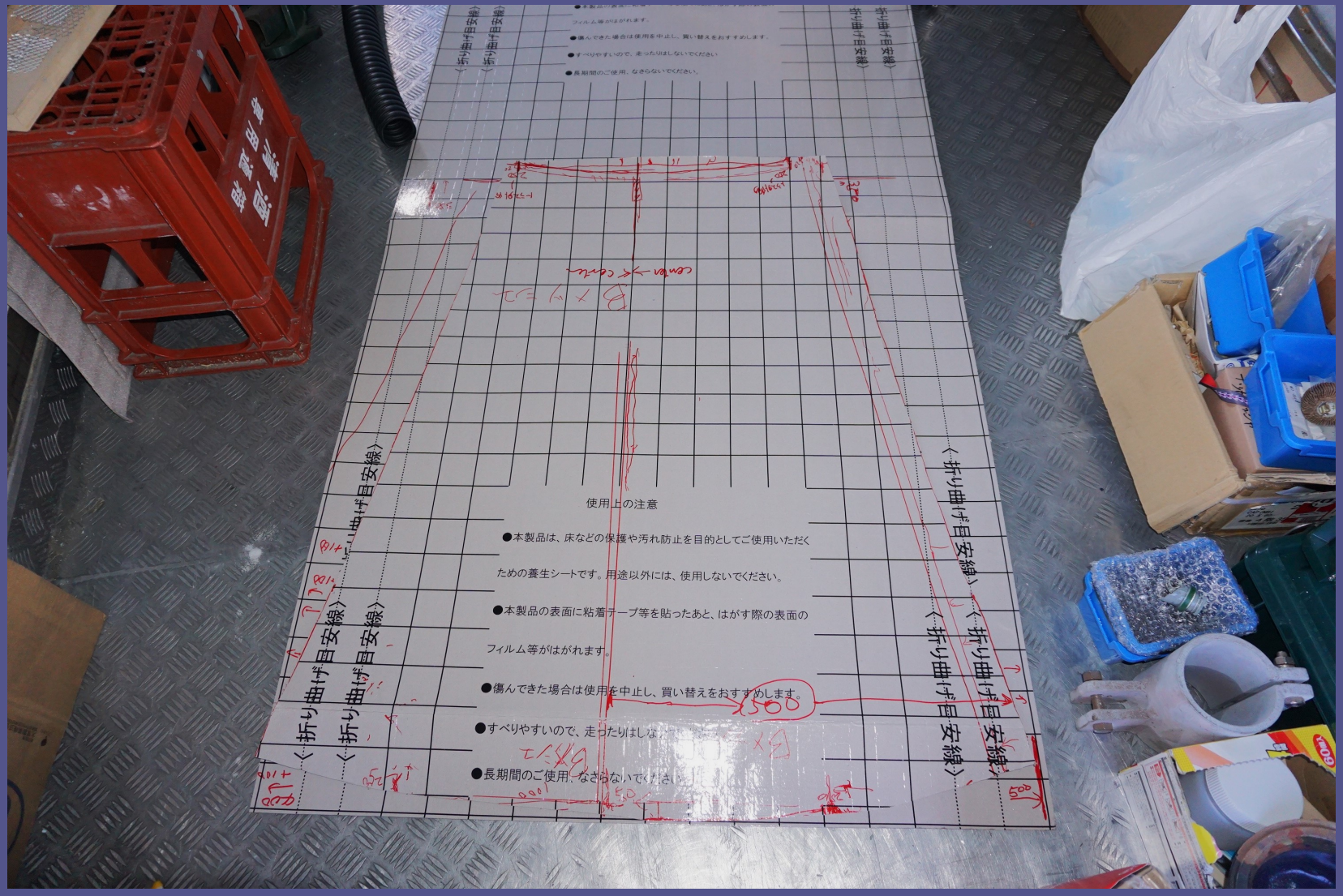
OK,OK !!



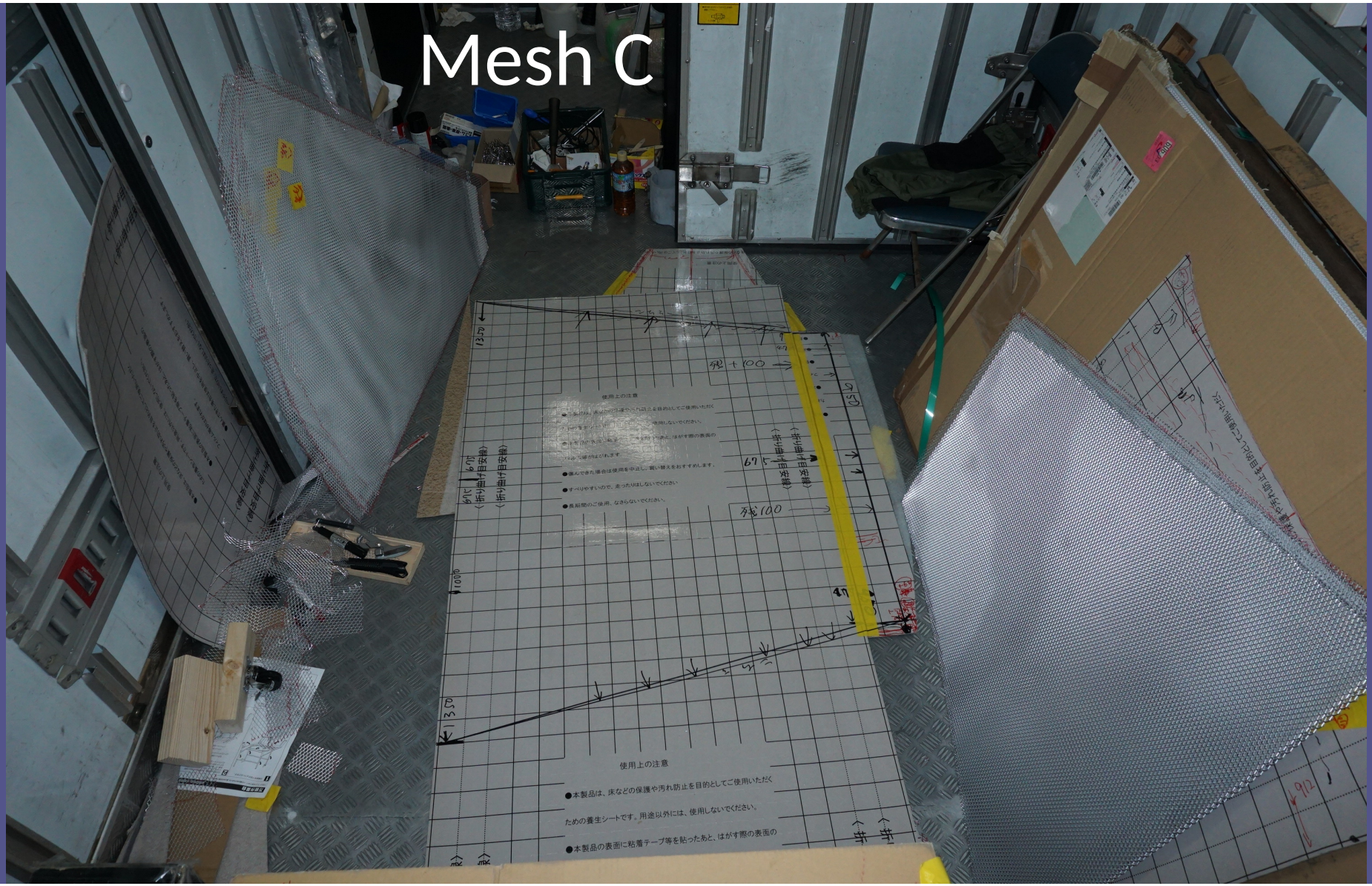
????

Trace
the mesh size

Next Mesh B
template


〈折り曲げ目安線〉
〈折り曲げ目安線〉
〈折り曲げ目安線〉
〈折り曲げ目安線〉
使用上の注意
●本製品は、床などの保護や汚れ防止を目的としてご使用いただくための養生シートです。用途以外には、使用しないでください。
●本製品の表面に粘着テープ等を貼ったあと、はがす際の表面のフィルム等がはがれます。
●傷んできた場合は使用を中止し、買い替えをおすすめします。
●すべりやすいので、走ったりはしな
●長期間のご使用、なさらないでください

Mesh C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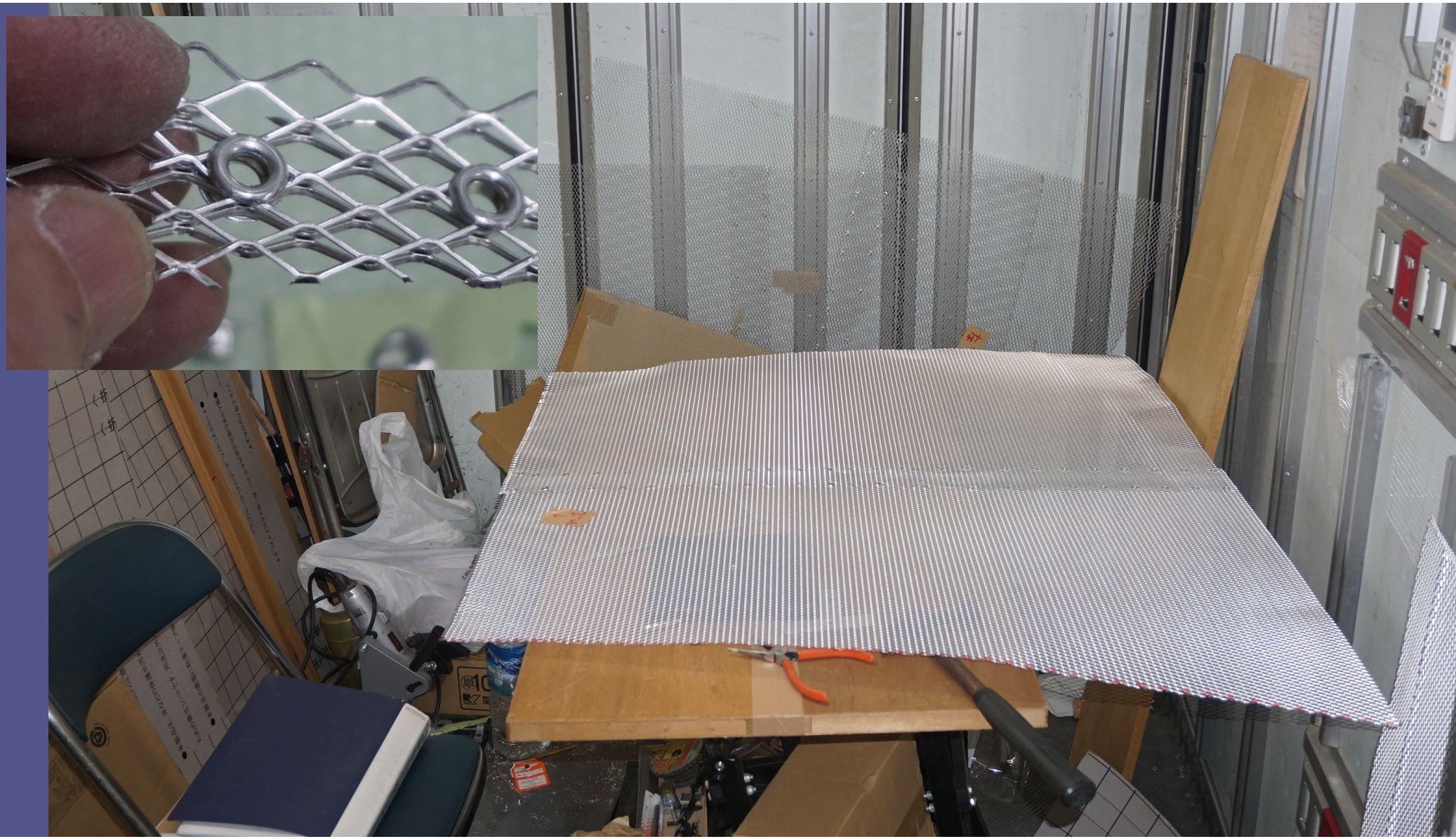
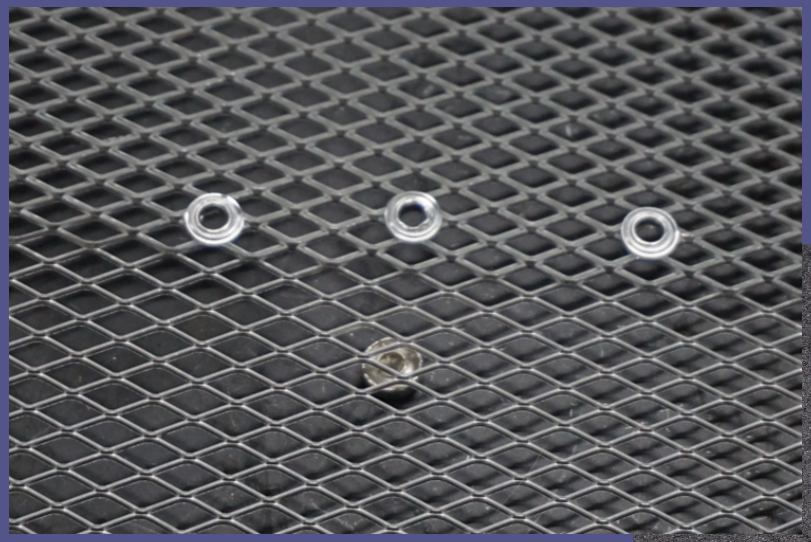
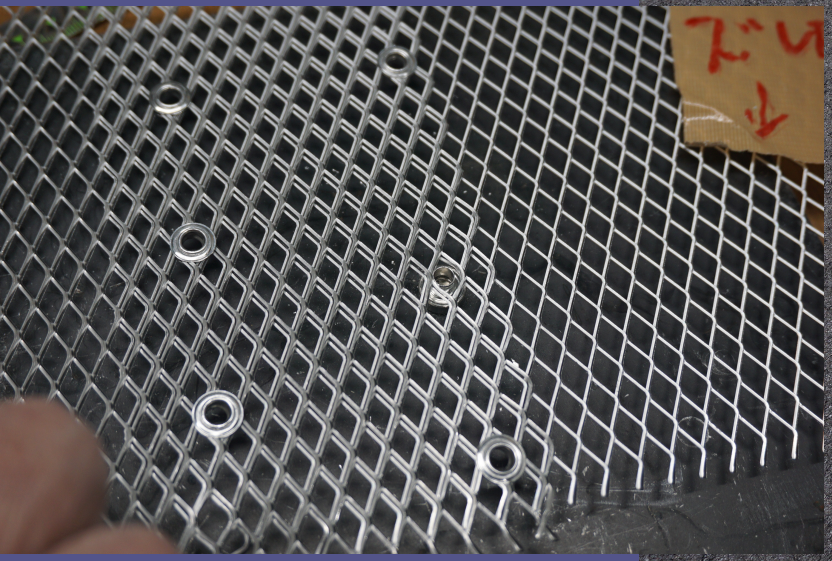
ための養生シートです。用途以外には、使用しないでください。
●本製品の表面に粘着テープ等を貼ったあと、はがす際の表面の

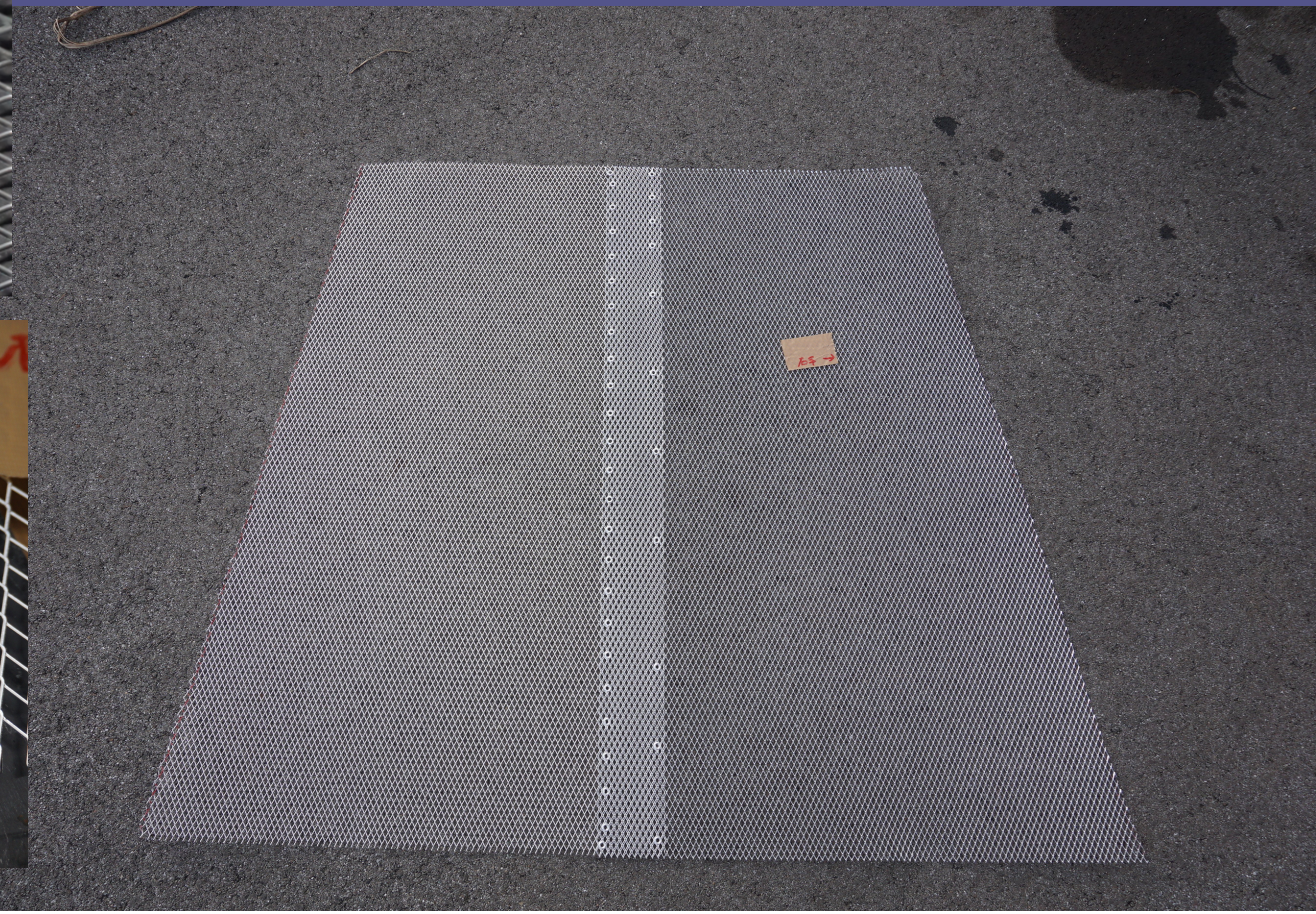
(Video) How to cut the mesh sheet



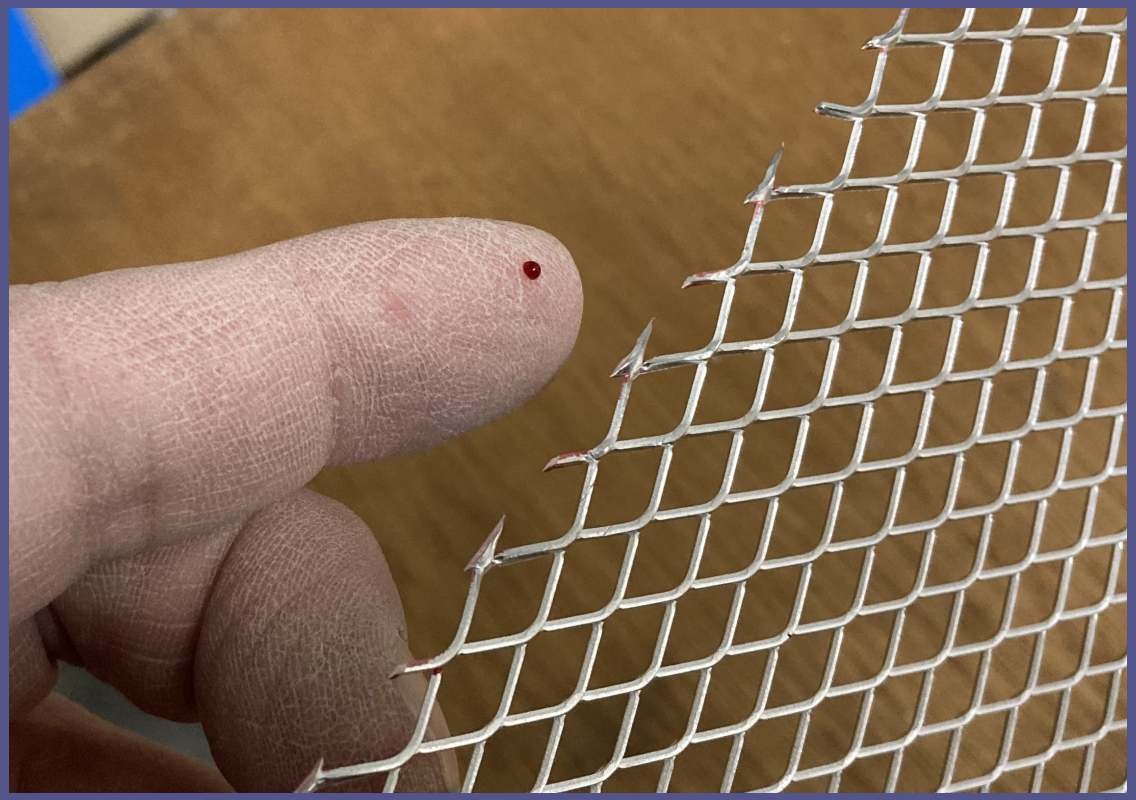
Five Mesh B, conntected by rivets







Mesh pricks your finger!



Wear thick
skin gloves!

But it will be
PENETRATED!

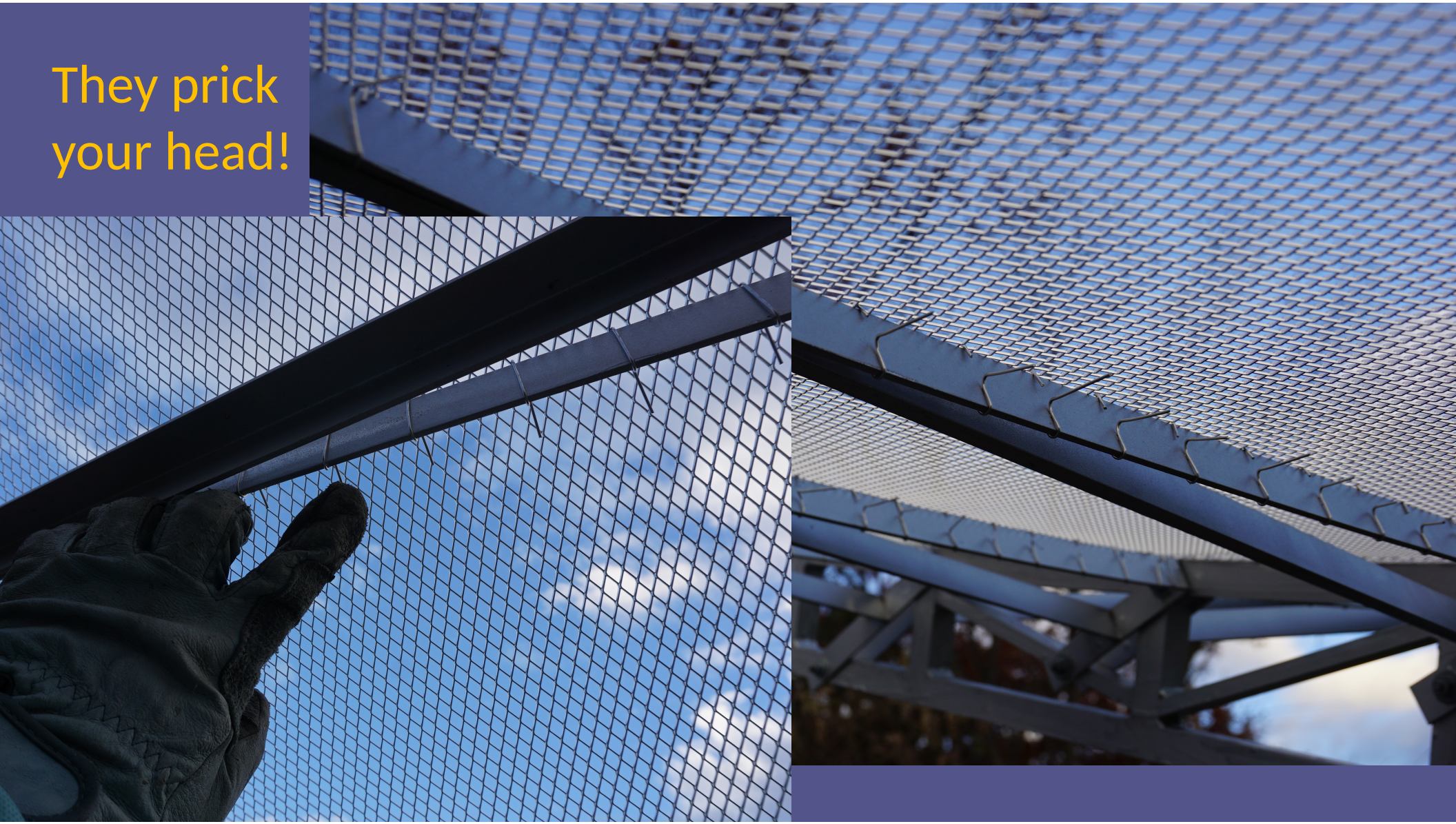
Love me, love my
ANTENNA!
My XYL Sylvie, JP1LAB

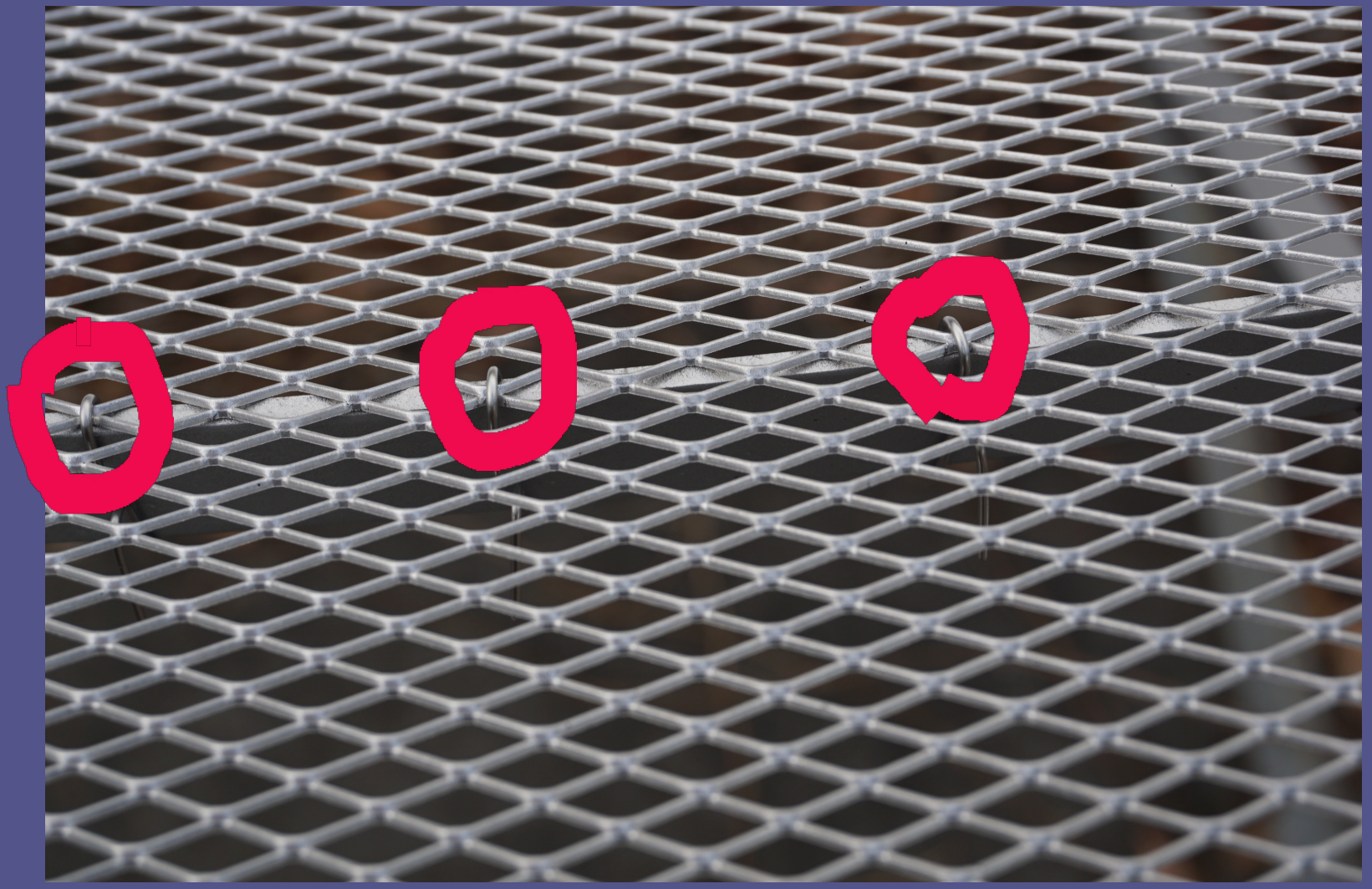
Mesh clips stay tight over 20 years!

Former TVRO 4.4-m

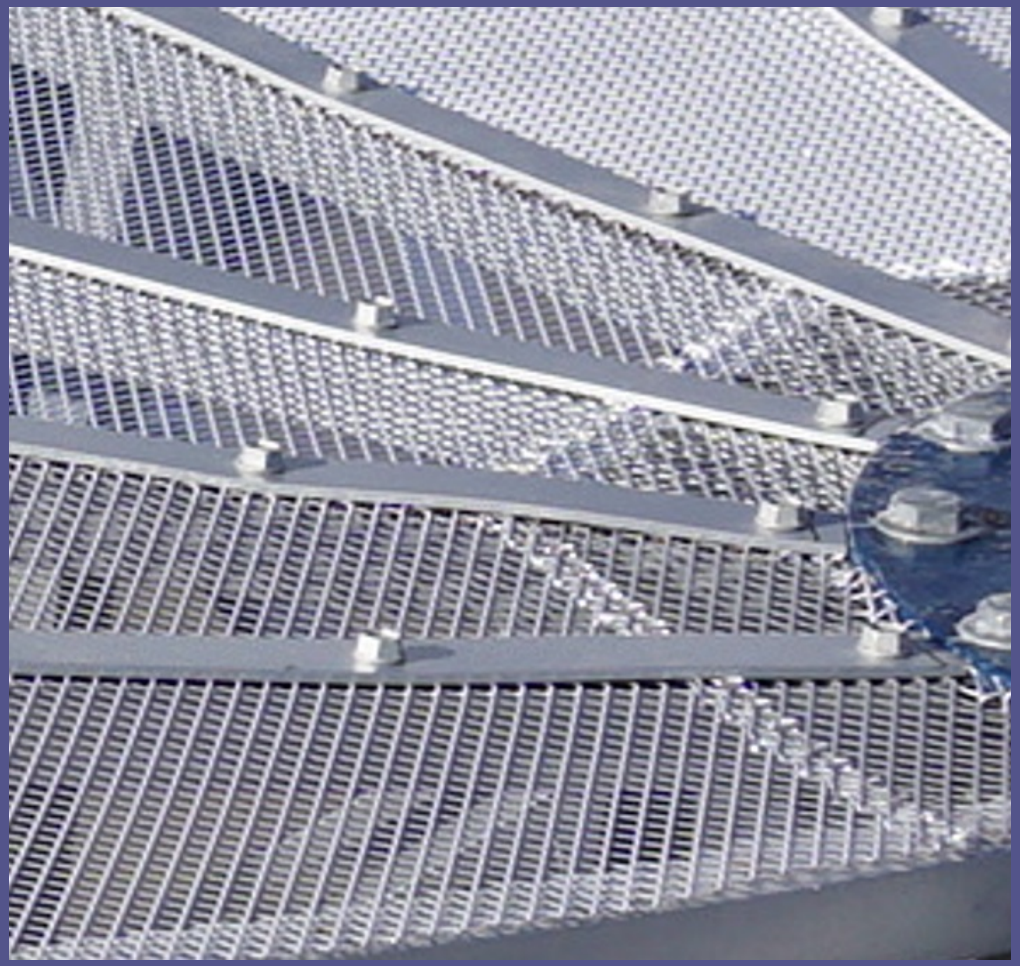
(Video) How to use mesh clips

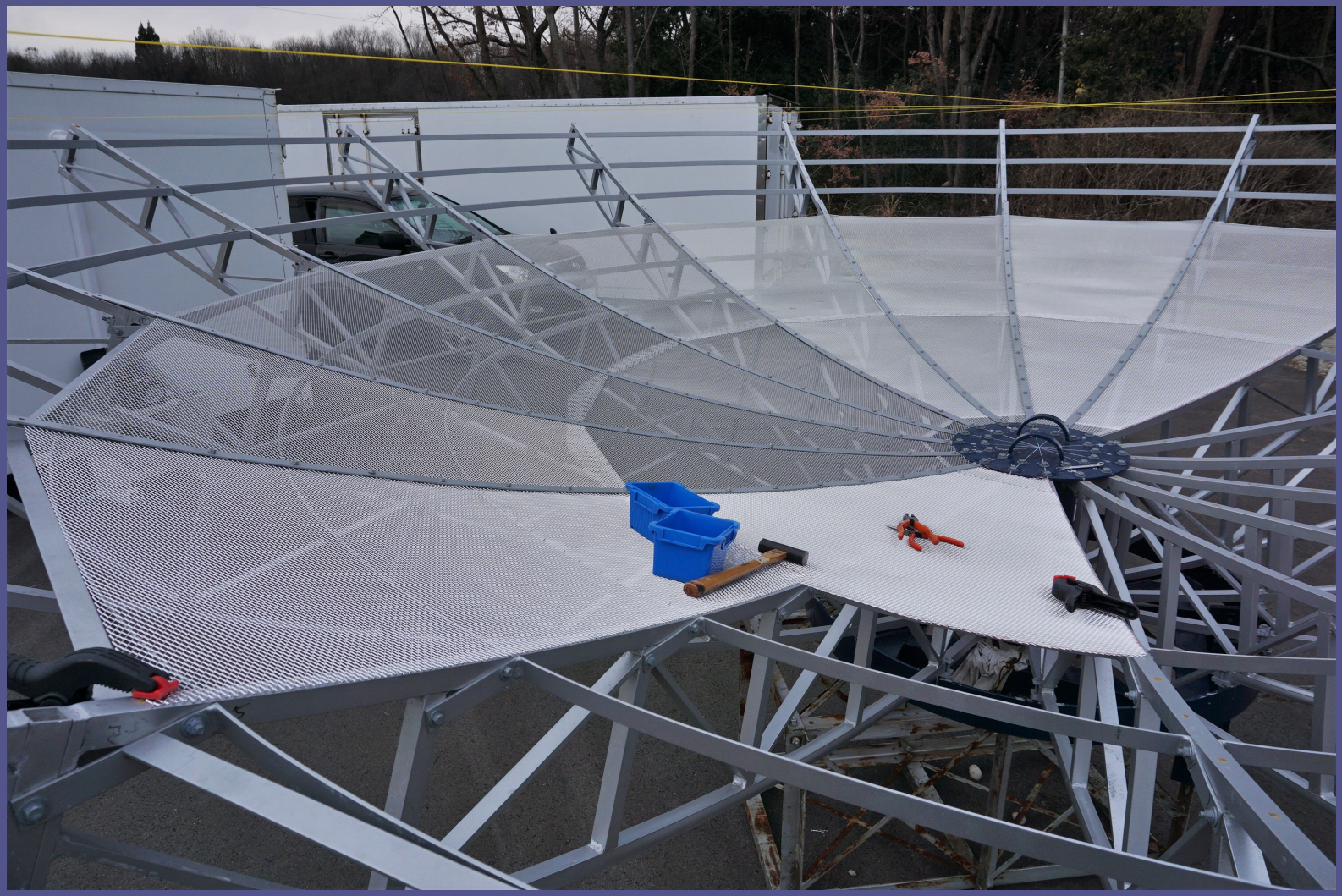
They prick your head!

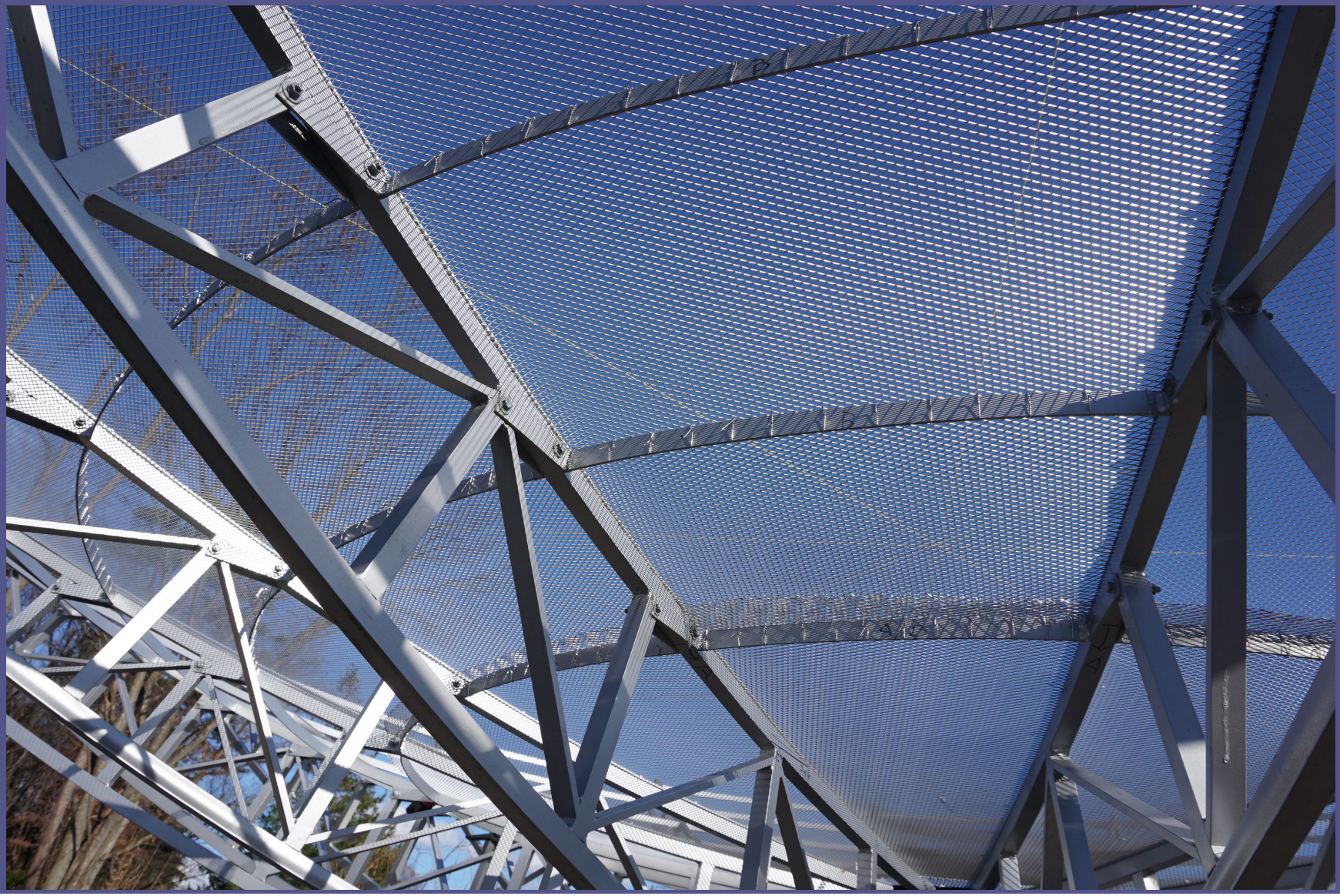




Mesh sheets were held by mesh strips and ¼" hex head thread drilling screws.

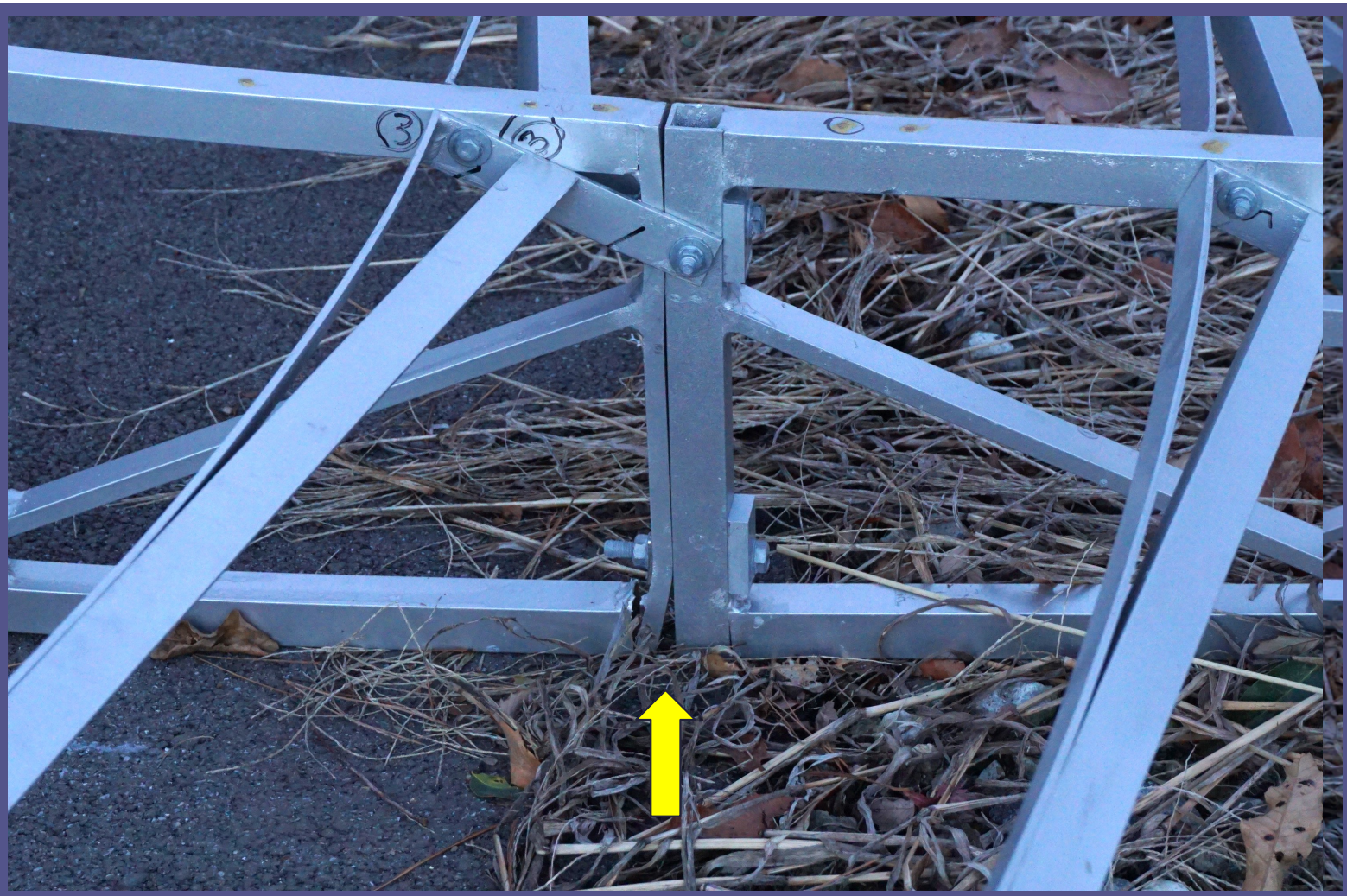






Dish tumbled

During a windy night, dish dropped off….



One truss structure got damage and needed repair.

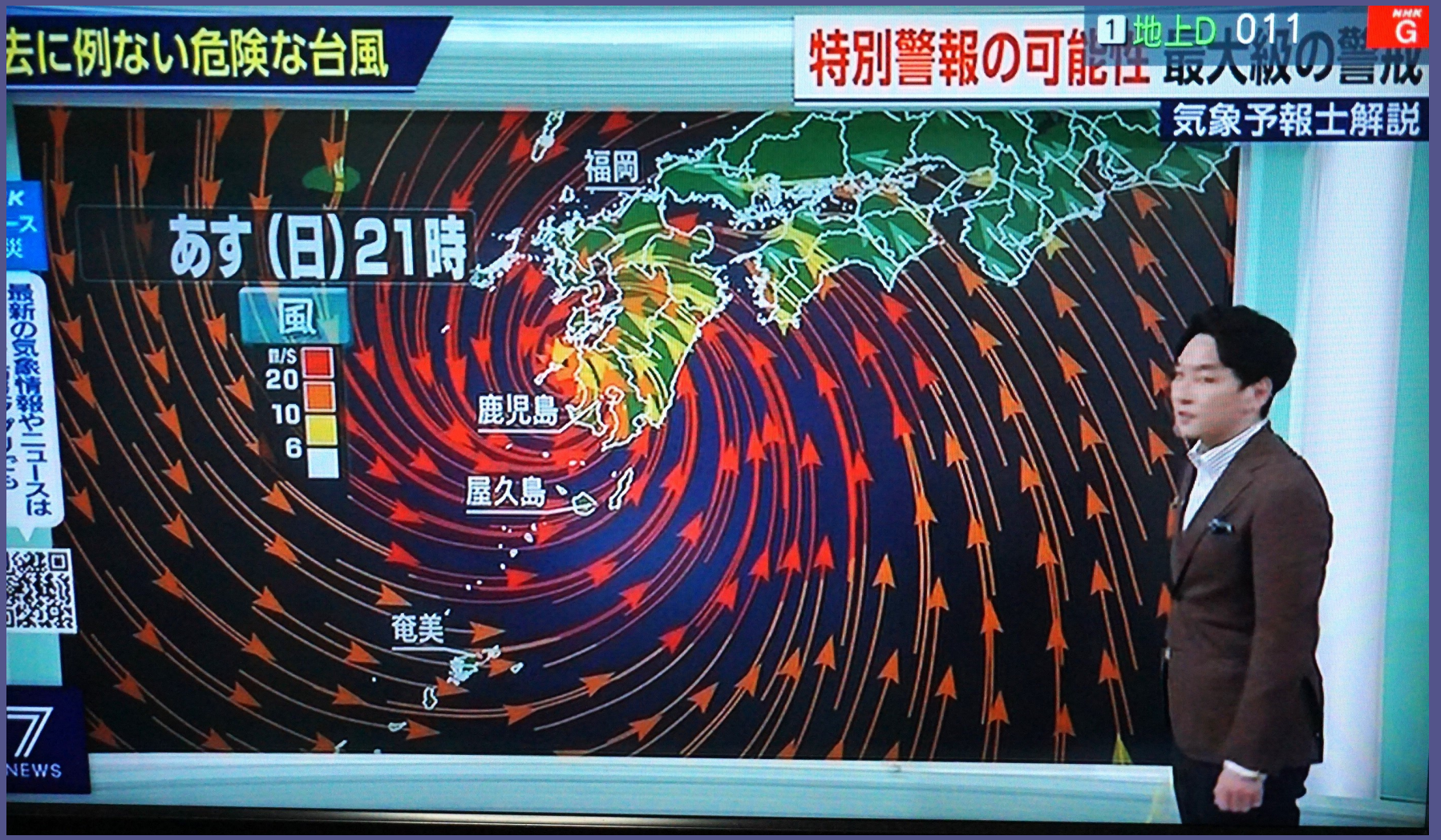
My good friend is always helpful.

TNX to JH1OHG!

Laceration

Take a rest….

Expansion to 7.8-M



A Big typhoon is coming…

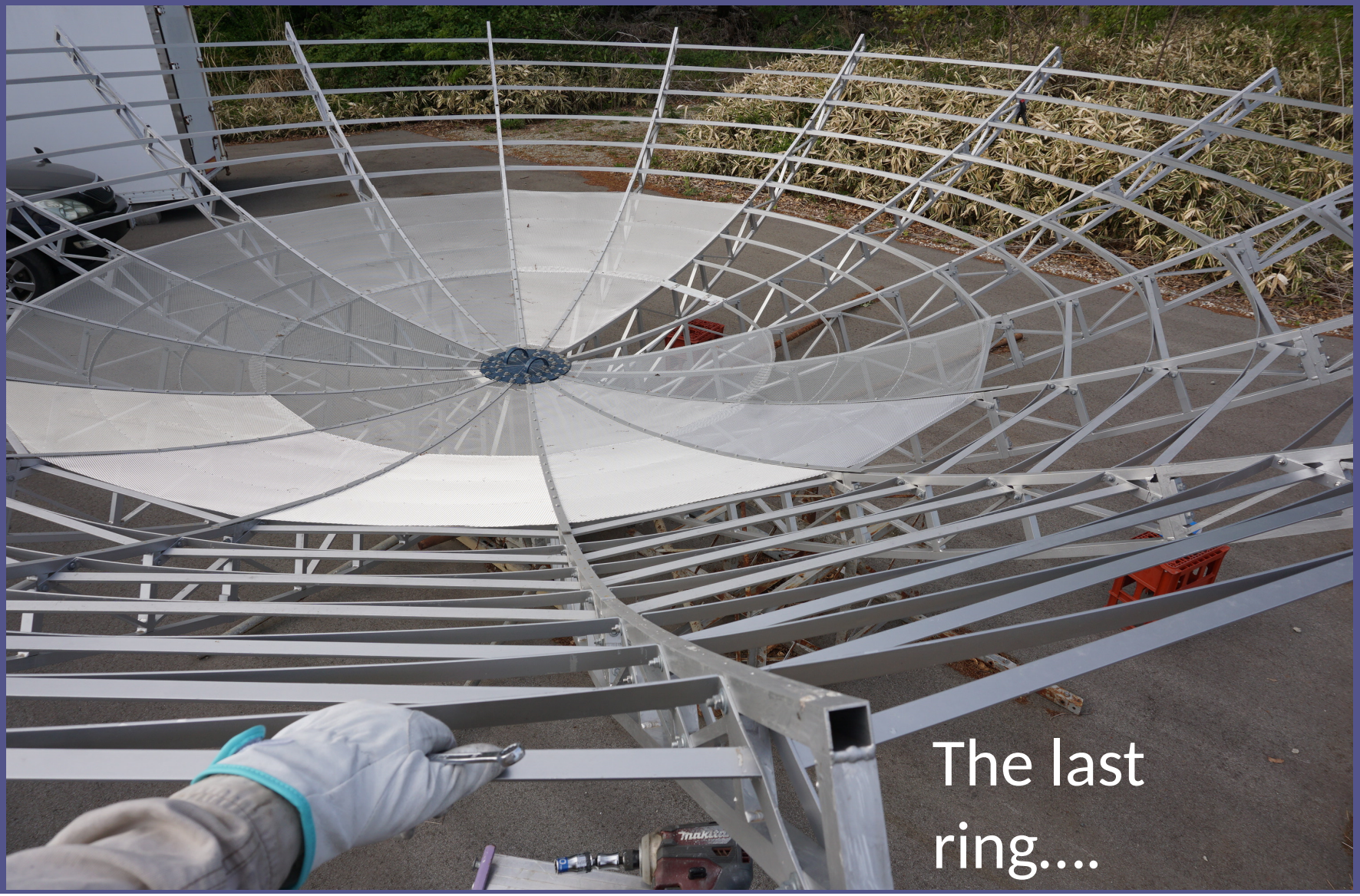
A Big typhoon is coming...

makita

Need to compensate with washers?

Precise connection is important.

No need to compensate.


The last
ring….

ARRL DX Contest
2023

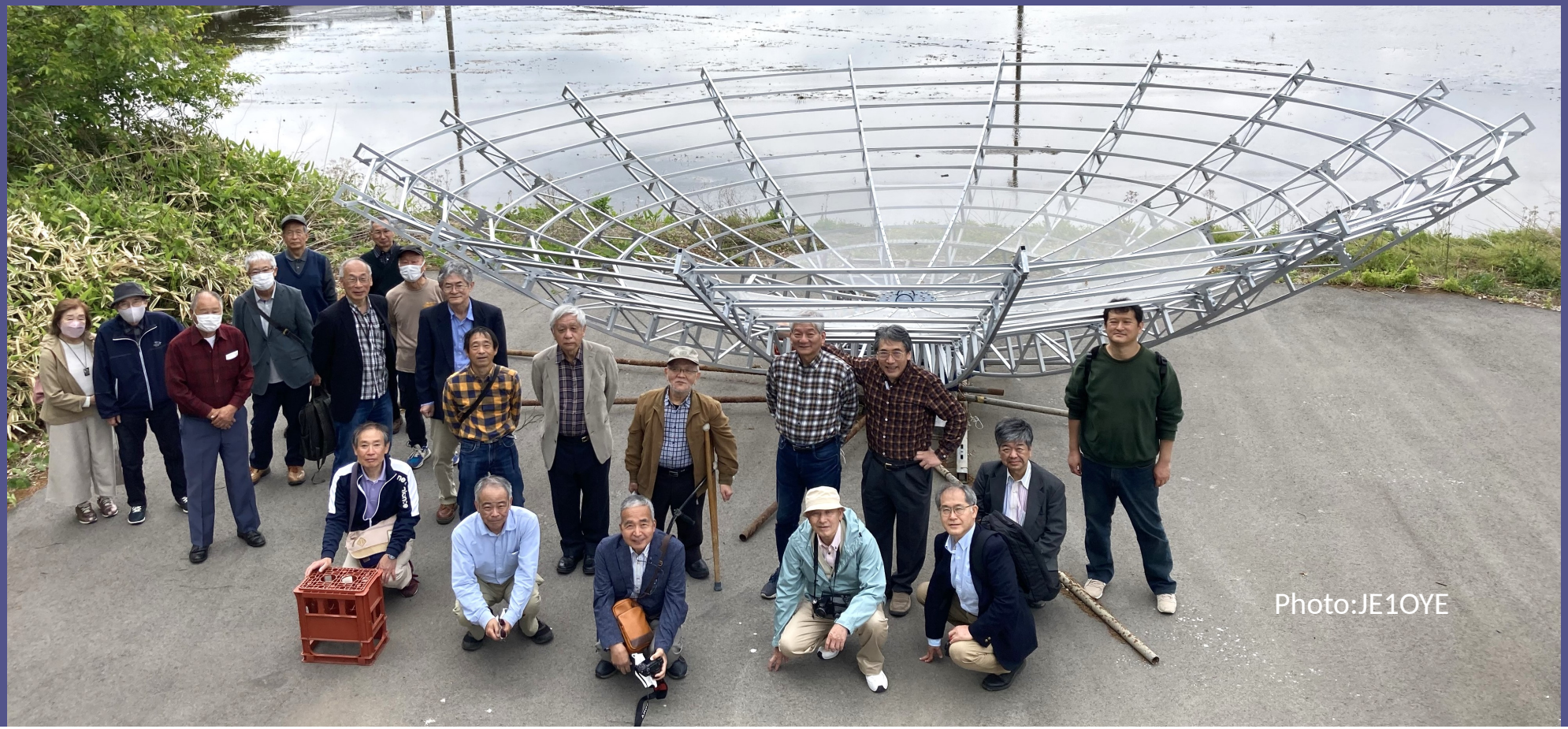
1st Place, Asia

SSB 15M, Single op.
(Non assisted)
High power

SKYNEEDLE
From W6KPC

The 11th JA-EME National Meeting

in Nasushiobara, Tochigi May 11-12, 2023



The 11th JA-EME National Meeting

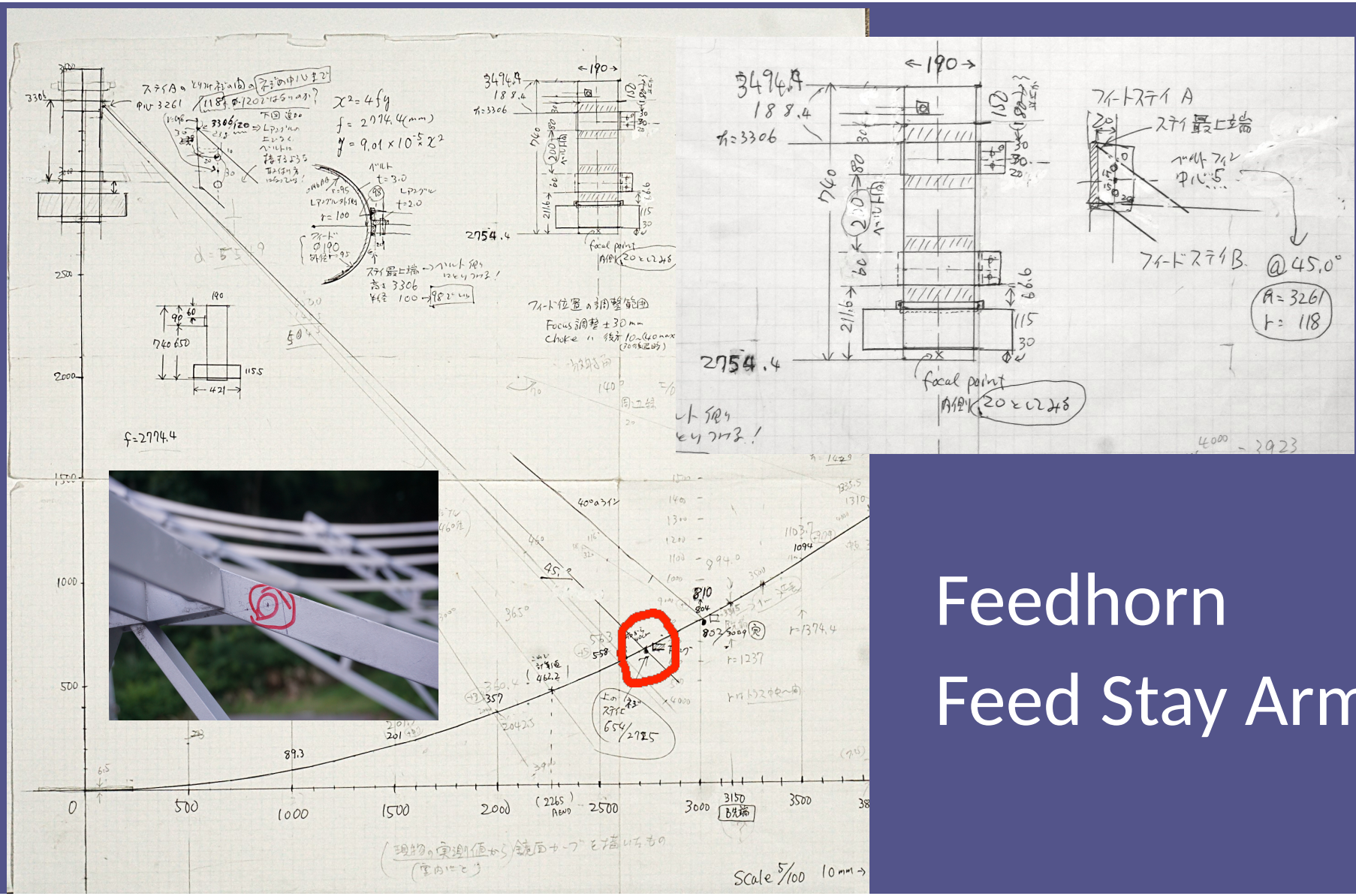
In Nasushiobara, Tochigi May 11-12, 2023

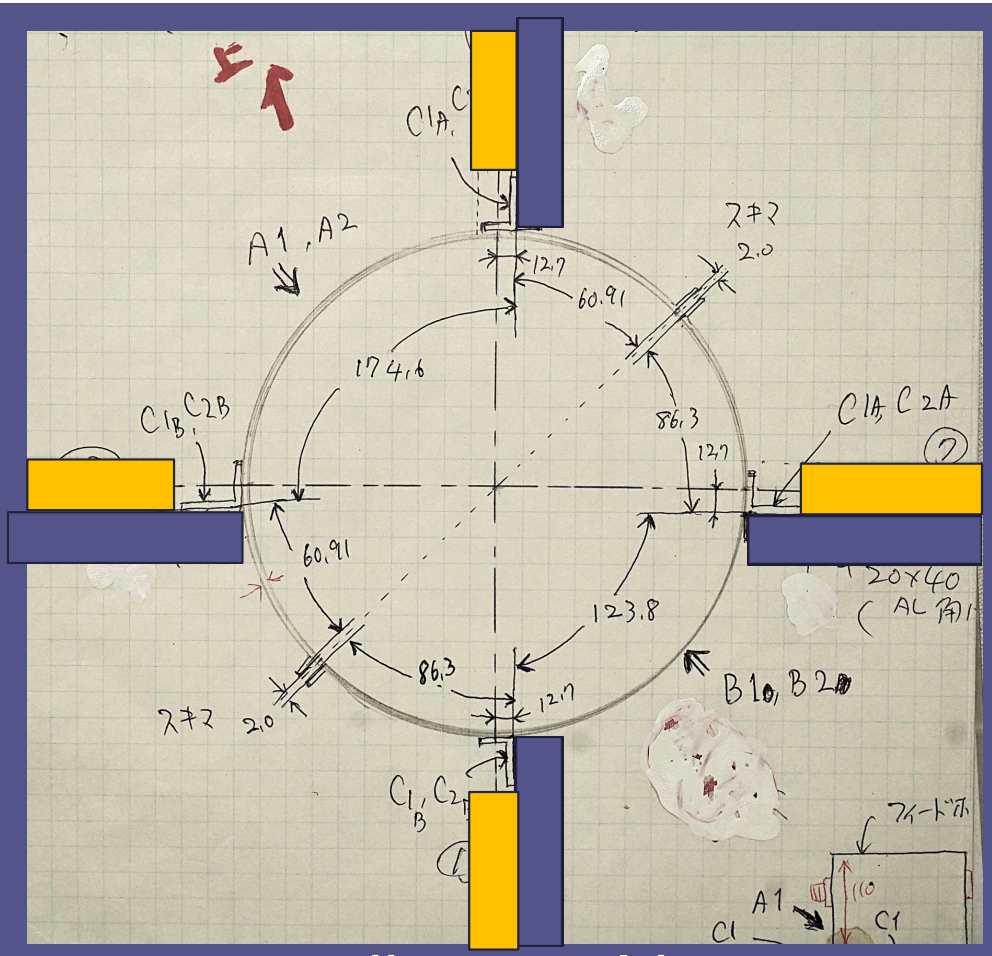
Vegetable?

Creeper likes to go horizontally.

OM6AA septum
For 4.4-m TVRO

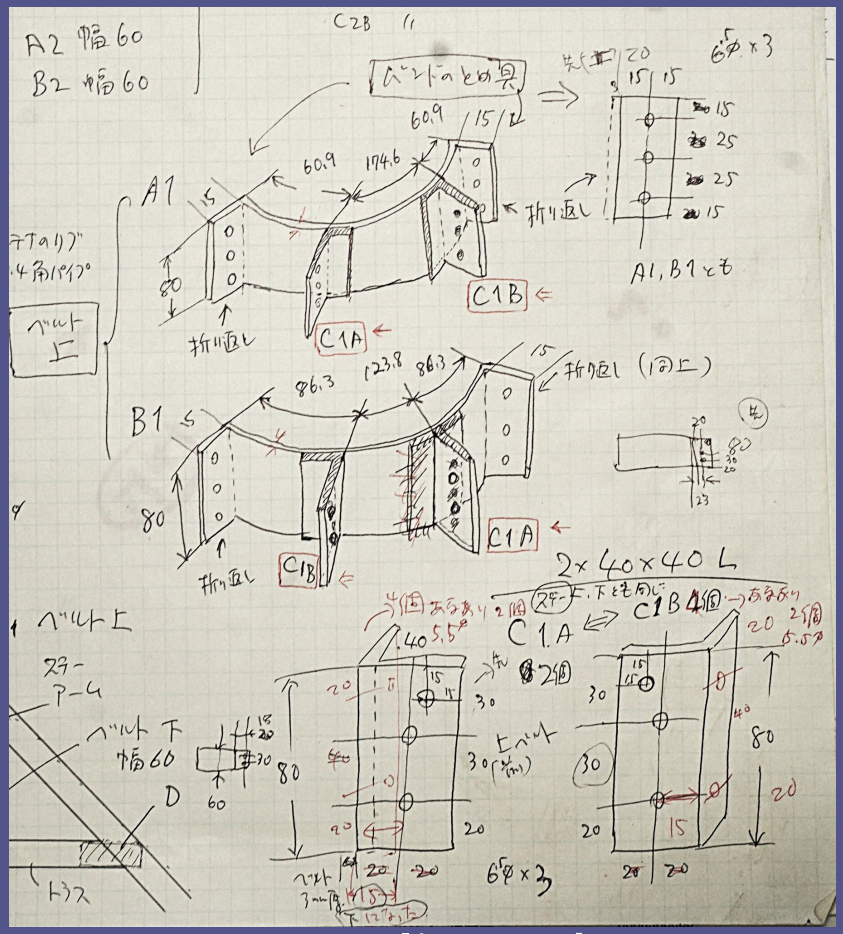
With Super Choke Ring


Feedhorn
Feed Stay Arm



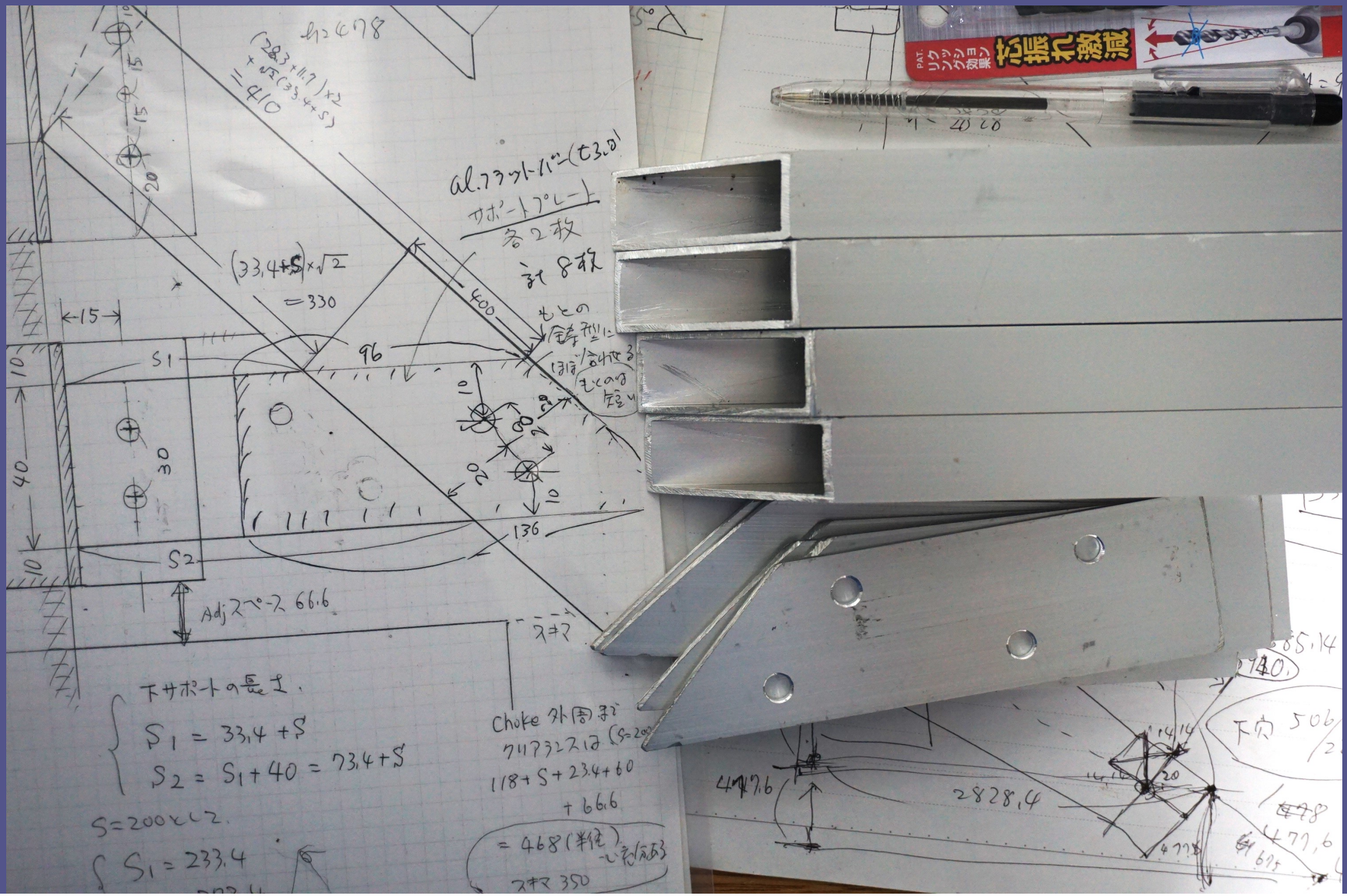
Feedhorn Holders

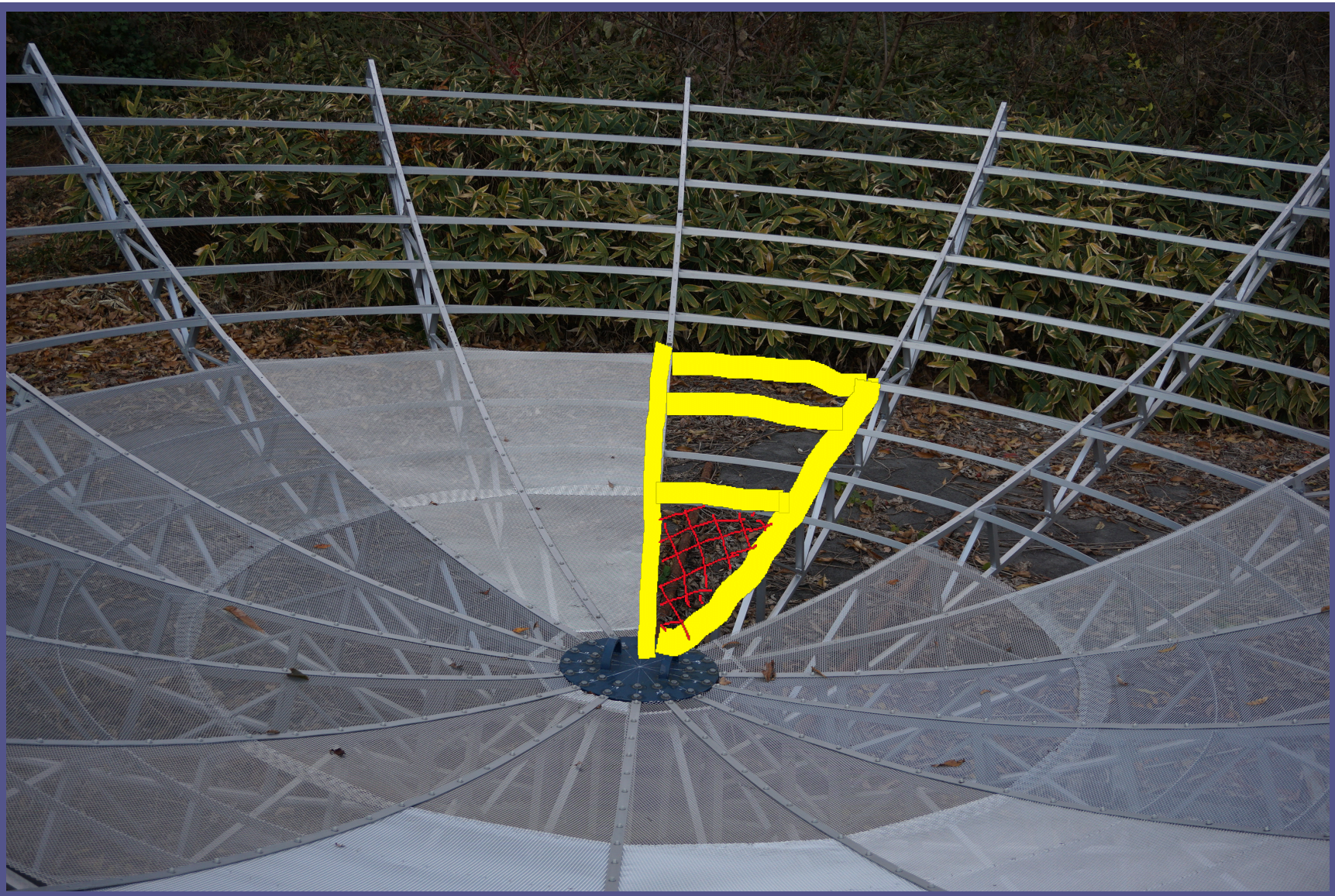
Stainless steel

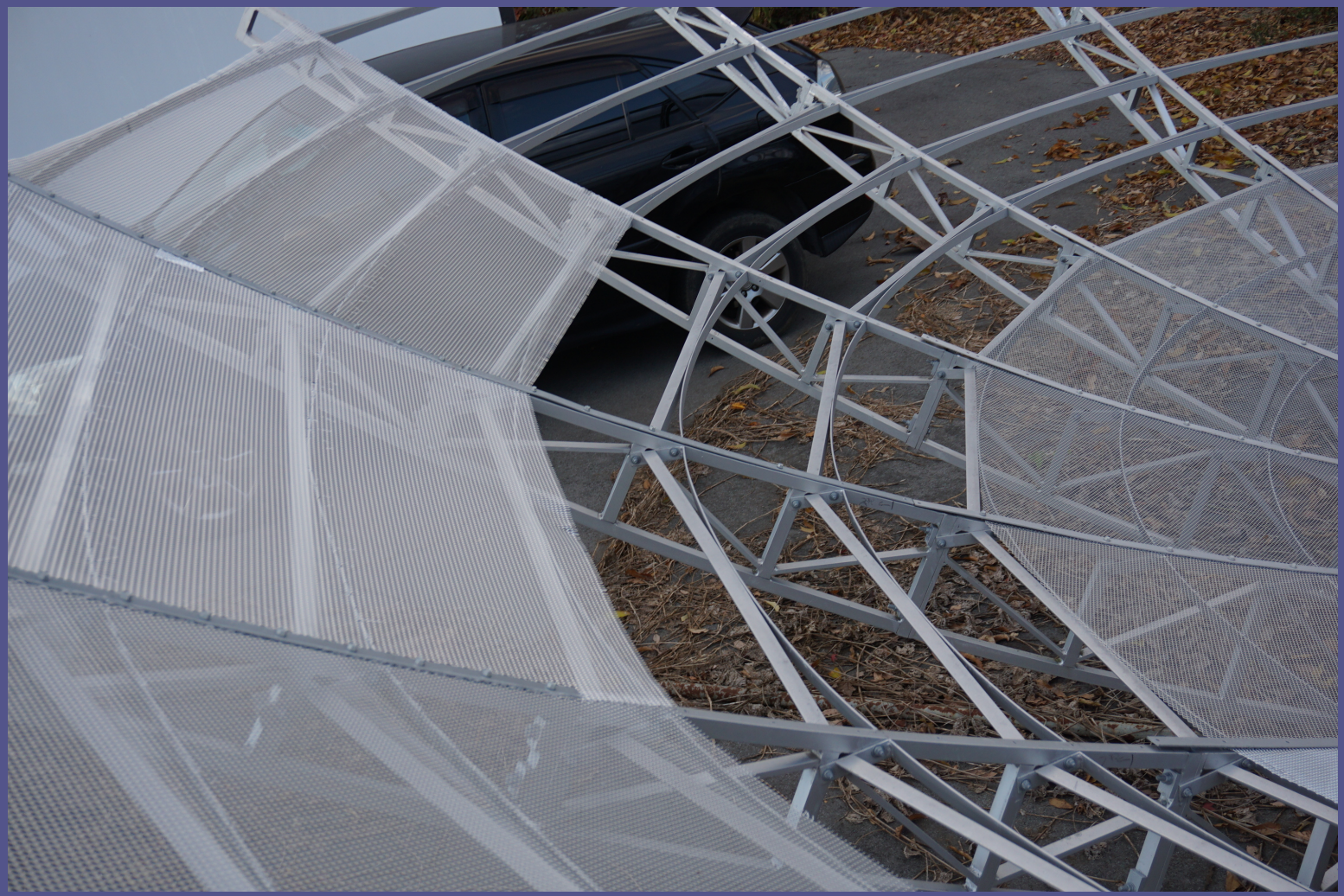


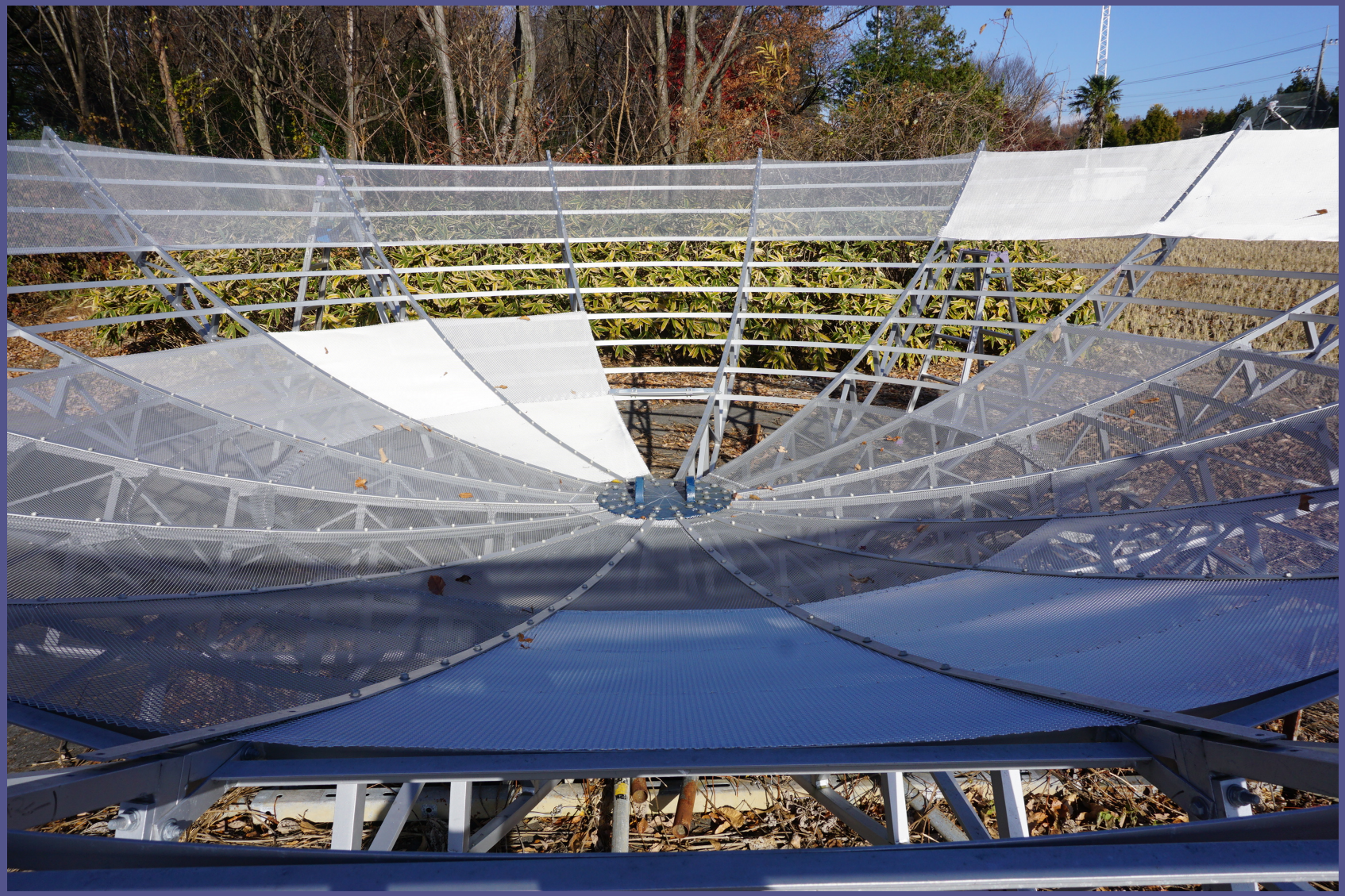
Too complicated

but substantial


(28.3+11.7)×2
+15(33.4+S)
=410
al.フラットバー(t3.0)
サポートプレート上
各2枚
計8枚
(33.4+S)×√2
=330
400
15
96
S1
S2
40
30
10
136
Adjスペース 66.6
スキマ
もとの金型にほぼ合致するものが欲しい
下サポートの長さ
S1 = 33.4 +S
S2 = S1+40 = 73.4+S
S=200とした
S1 = 233.4
Choke外周までクリアランスは(S=200)
118+S+23.4+60
+66.6
=468(半径)
スキマ350
PAT.
リクッションタイプ
滑らせ鉛筆
447.6
282.8.4
下穴 5.06





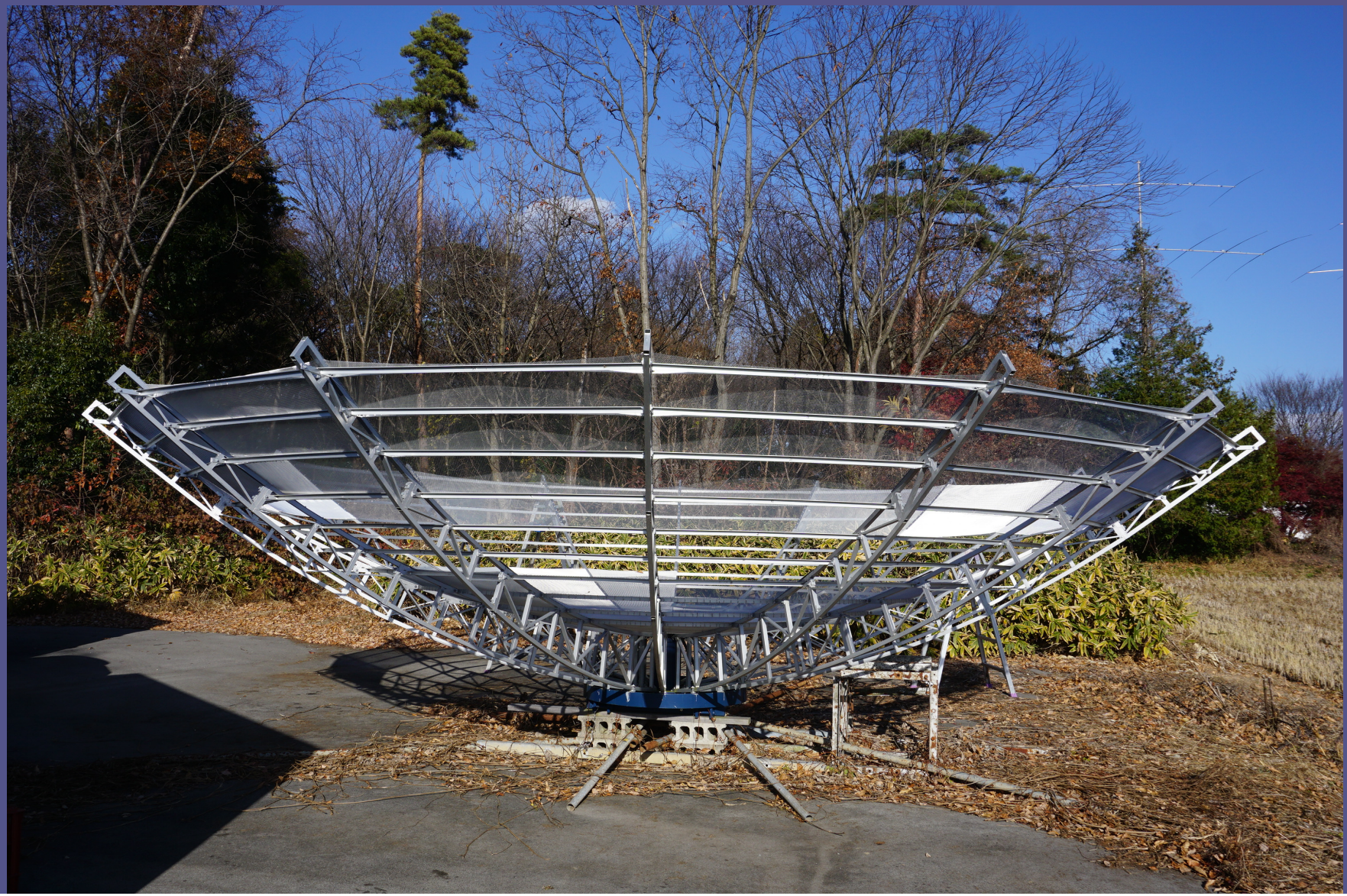


Step ladder

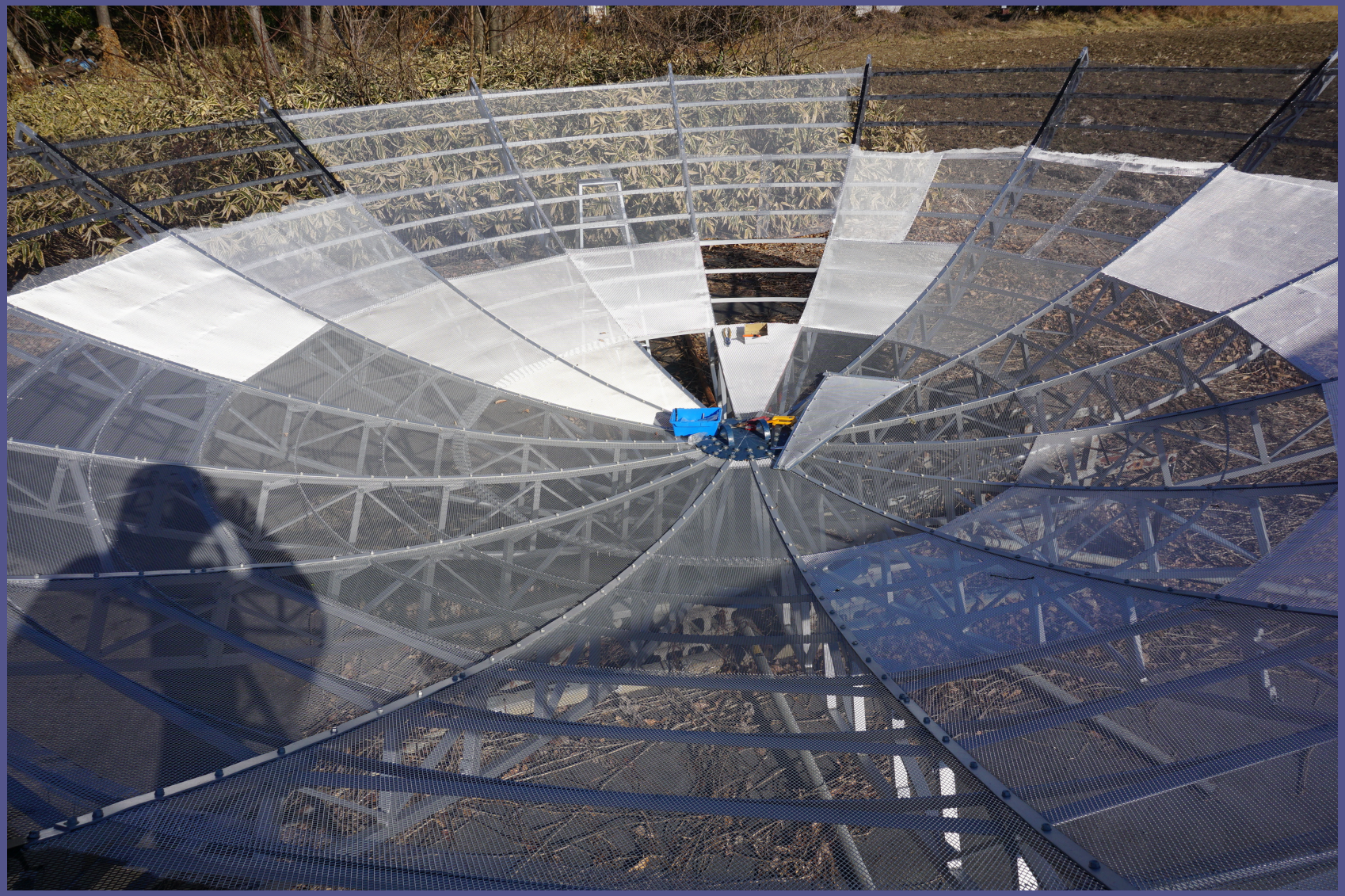
Upper Mesh and Paint
Easy access from the lower side

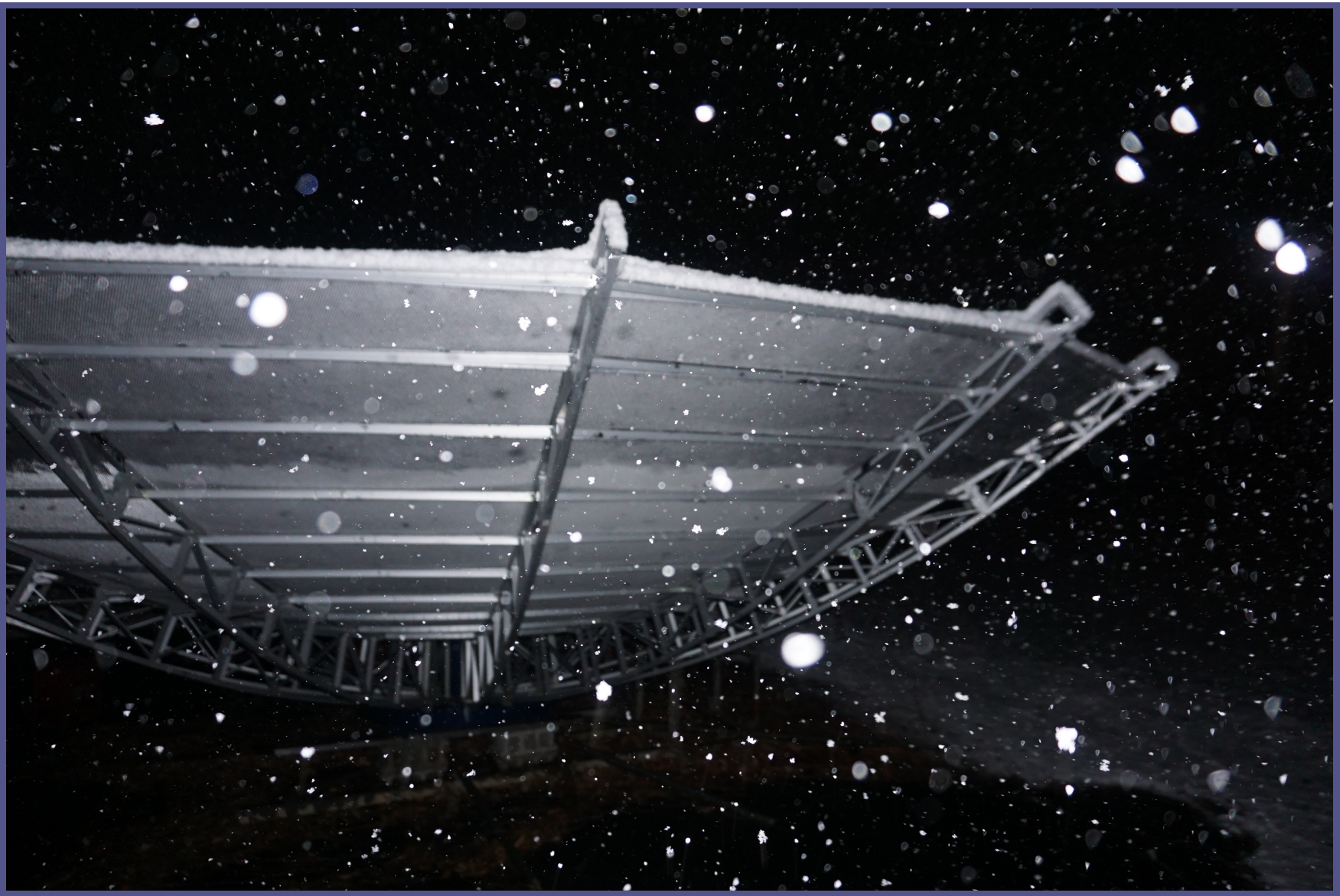
Drilling screw (Video)

SA6BUN tells
matte BLACK is the
best.



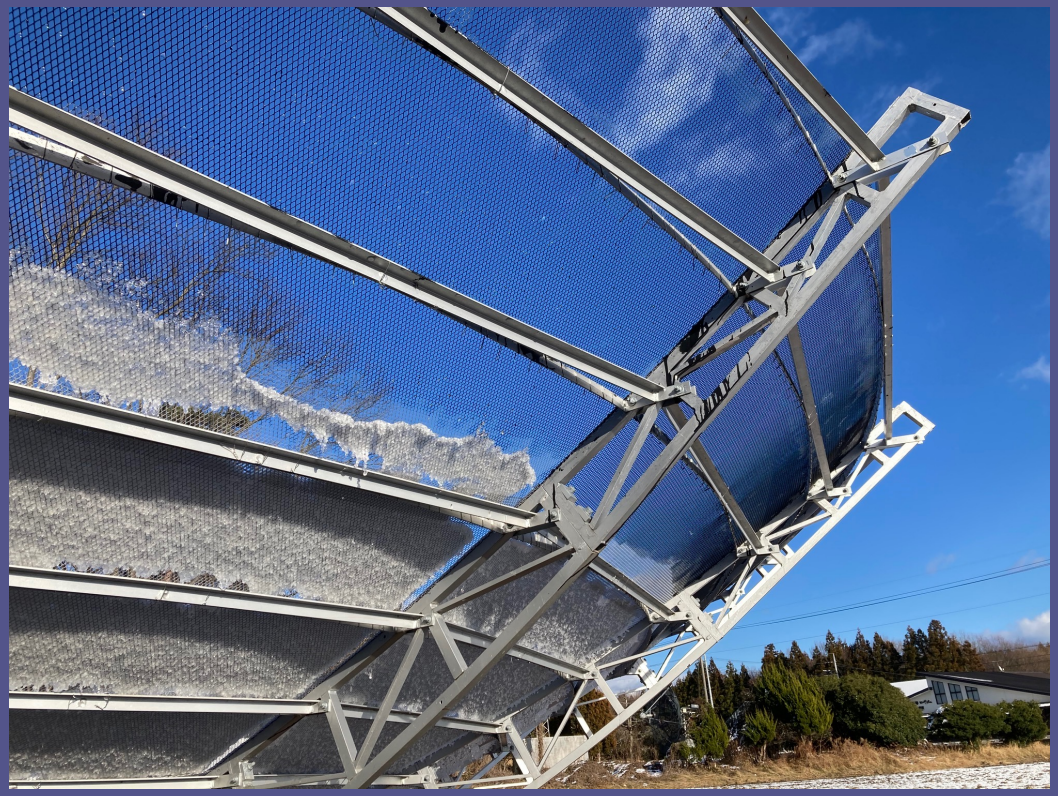
Upper part was painted in matte black.



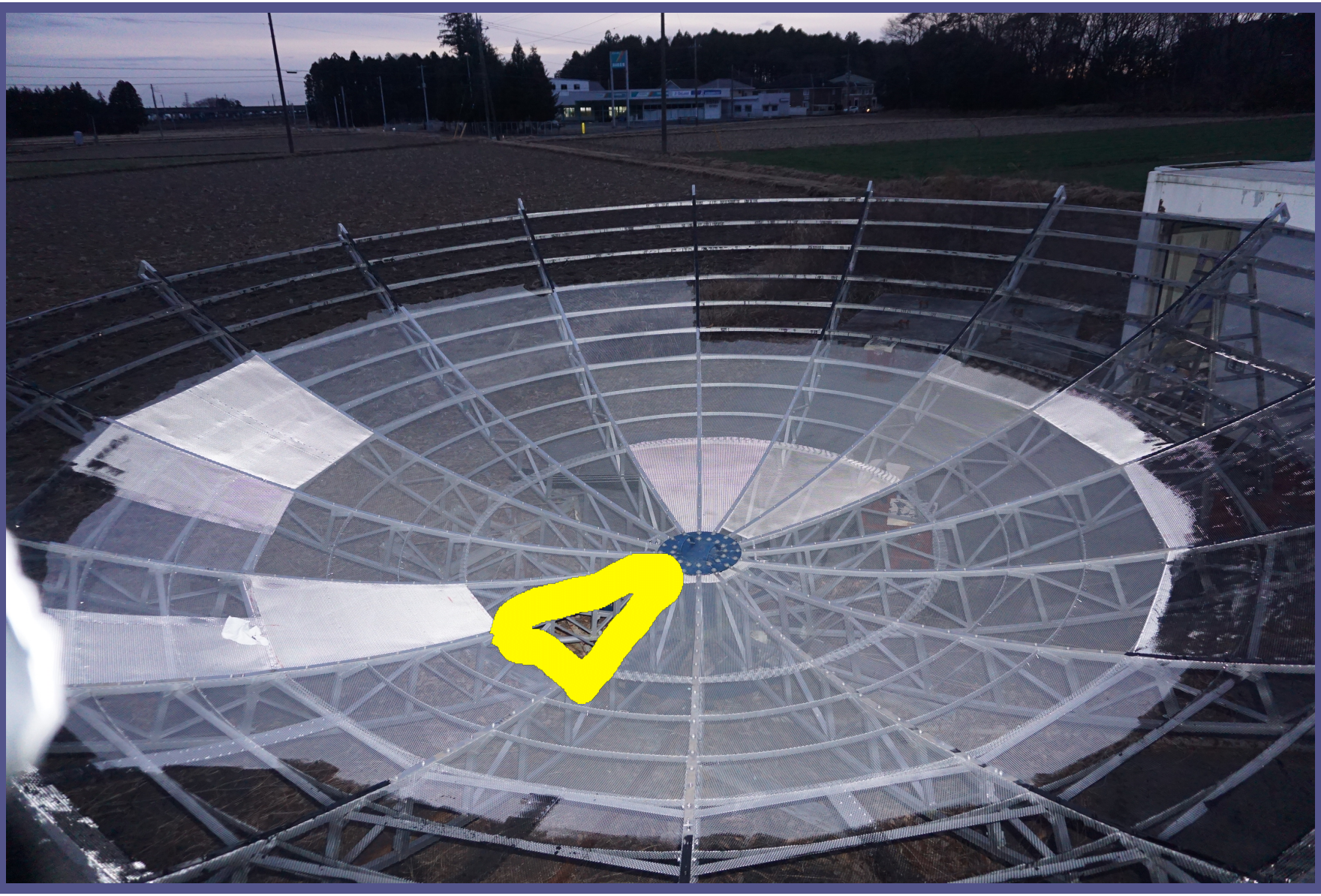


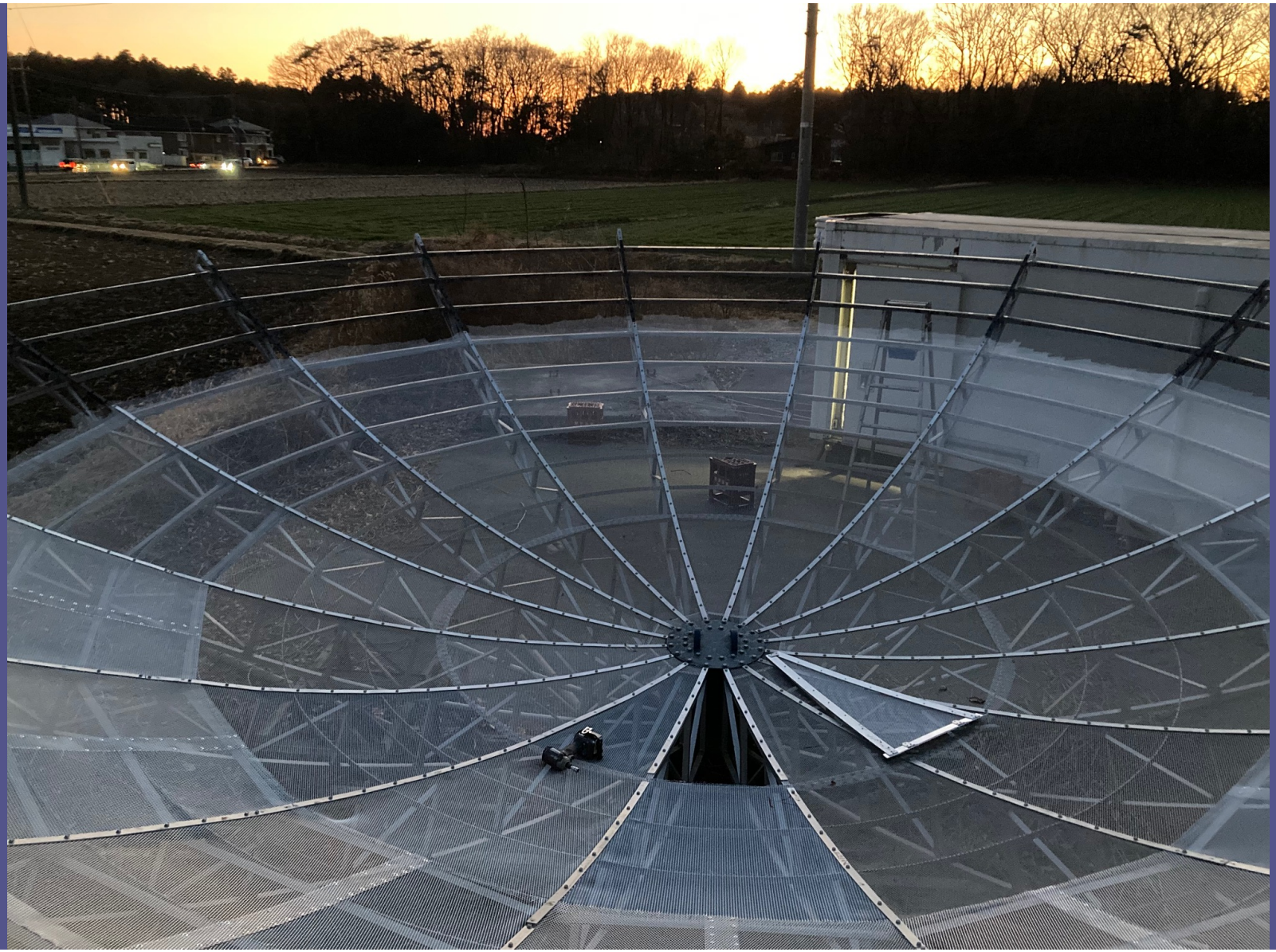
Snow melted faster!

Upper part was painted in matte black



Happy New Year 2024!

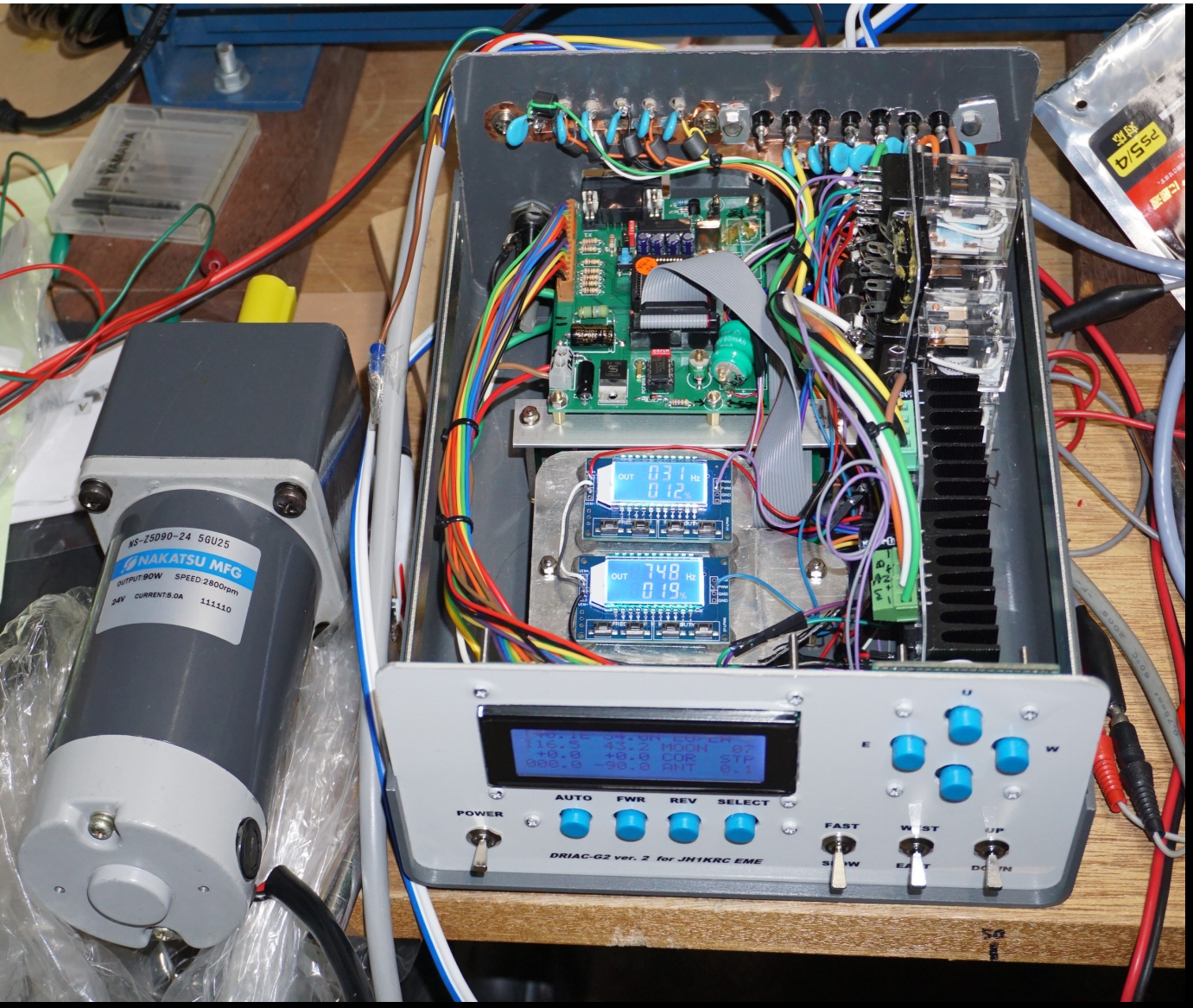




Metal Work at Factory

Original design
by JA6CZD

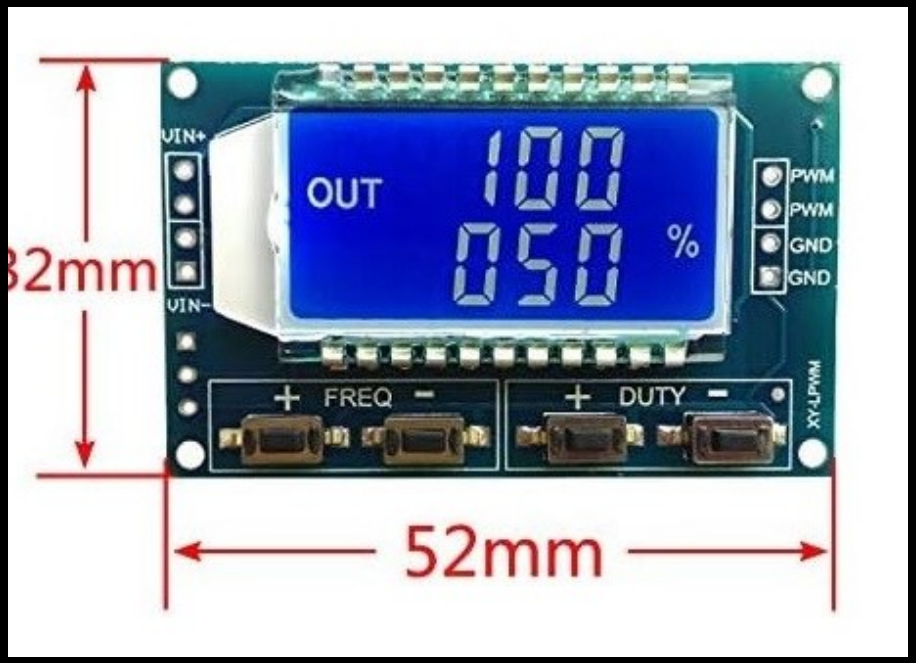
Materials were Hot Dip-galvanized



OE5JFL/HB9DRI
controller

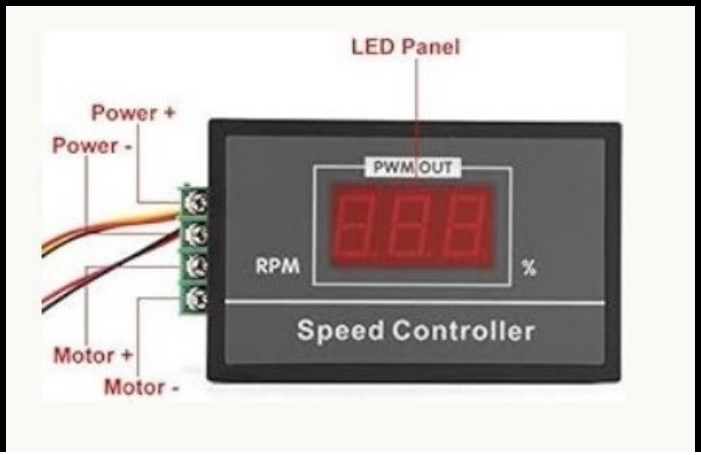
+ IBT-2 H-bridges
+ Chinese PWM
oscillators

Pulse Width Modulator (PWM) Oscillator for Manual Control



OUTPUT: +5 volts
Frequency (Hz)
Duty (%)

PWM regulator



Itamuro Onsen
Nasushiobara

有限会社 北部工業
TEL 0287(64)1146
KATO
野崎運送(有)

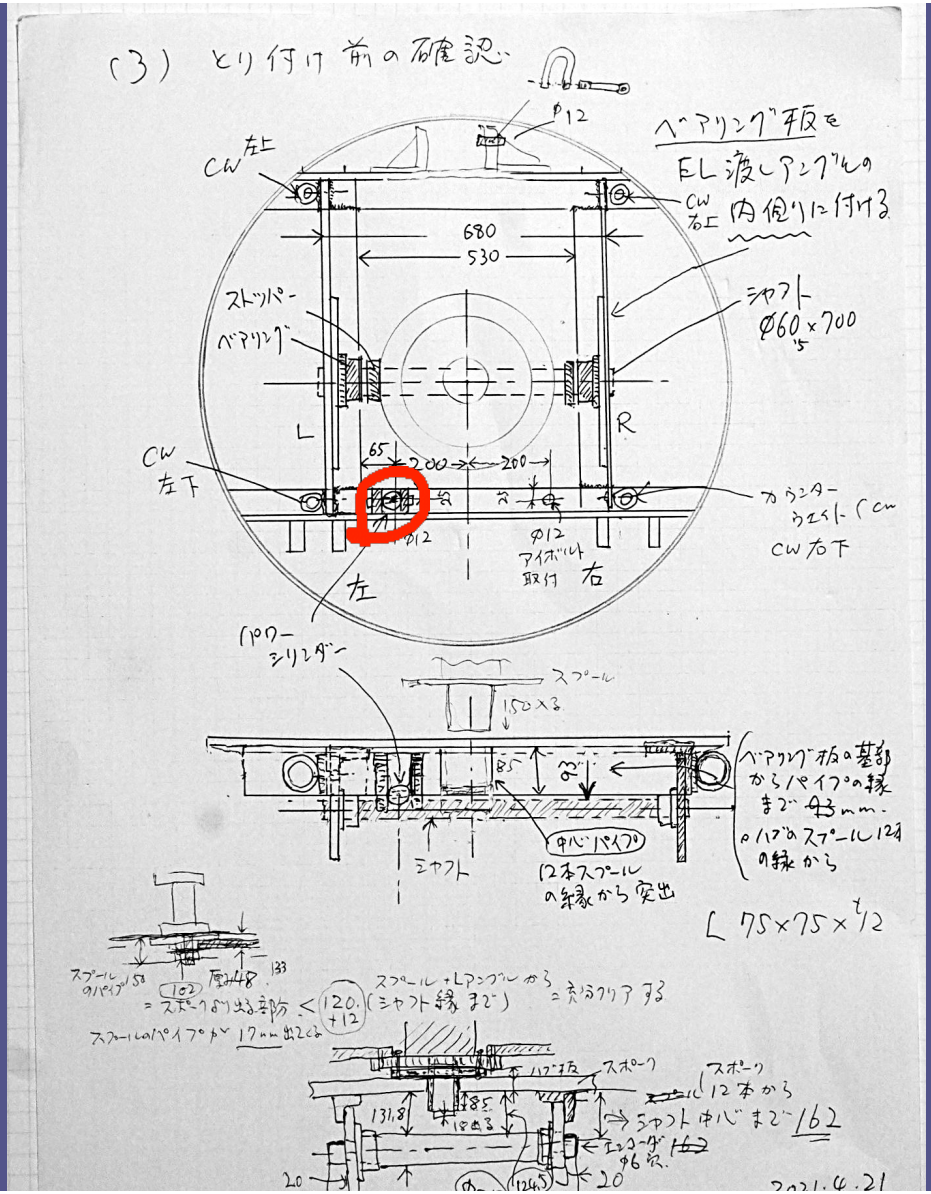
Lift Up the Dish May 2, 2024

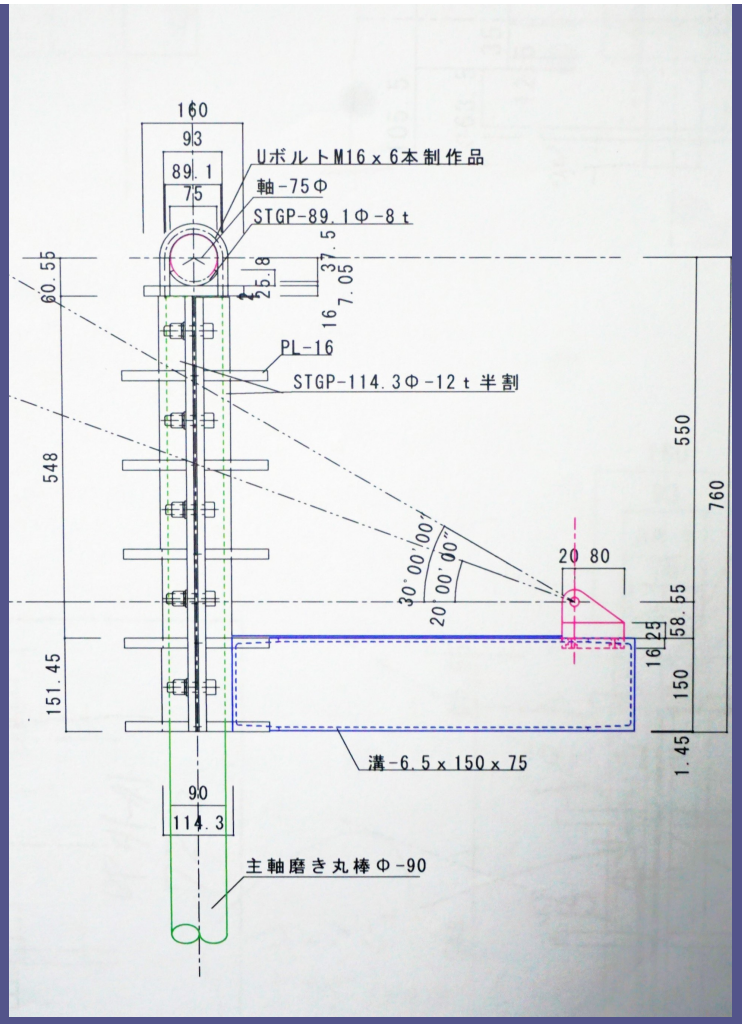
Four arms are held up, a crane can lift at the center.

(有)野崎運送
KATO
野崎運送(有)重機部
KATO
安全第一
野崎運送有重機部
野崎運送(有)
MR-130R

Elevation axis

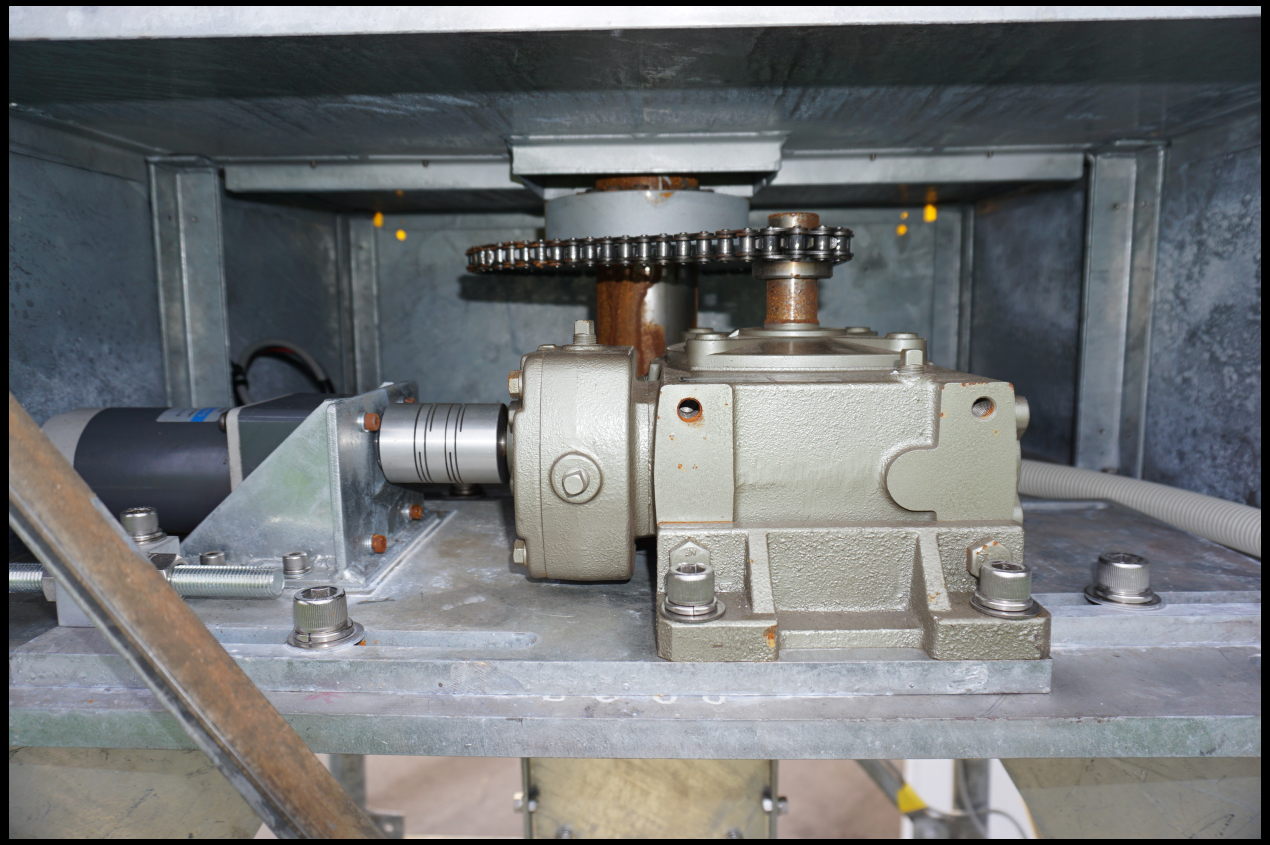
75 mm diameters





ELEVATION motor

Azimuth Rotator 180 deg./4 min.



24 V DC Geared Motor

Tsubaki Worm Gear

5:1 Chain Drive

Bearings

Azimuth geared motor/chain drive

Drive chain is tightened by the screws pushing back the motor/gear base plate.

Azimuth Encoder

Umbrella to prevent water drops

Power Cylinder

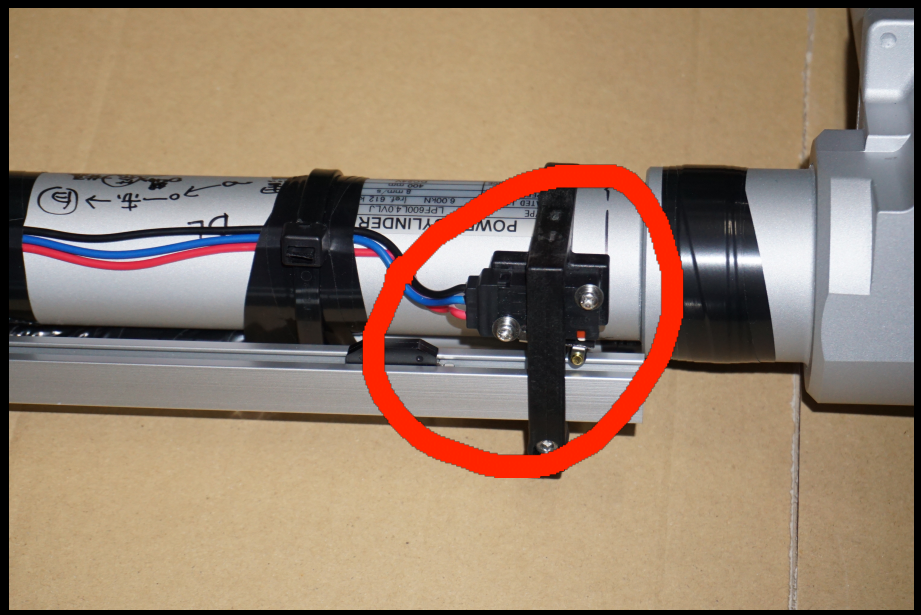
24 Volts, 10 Amps.
400 mm/50 seconds

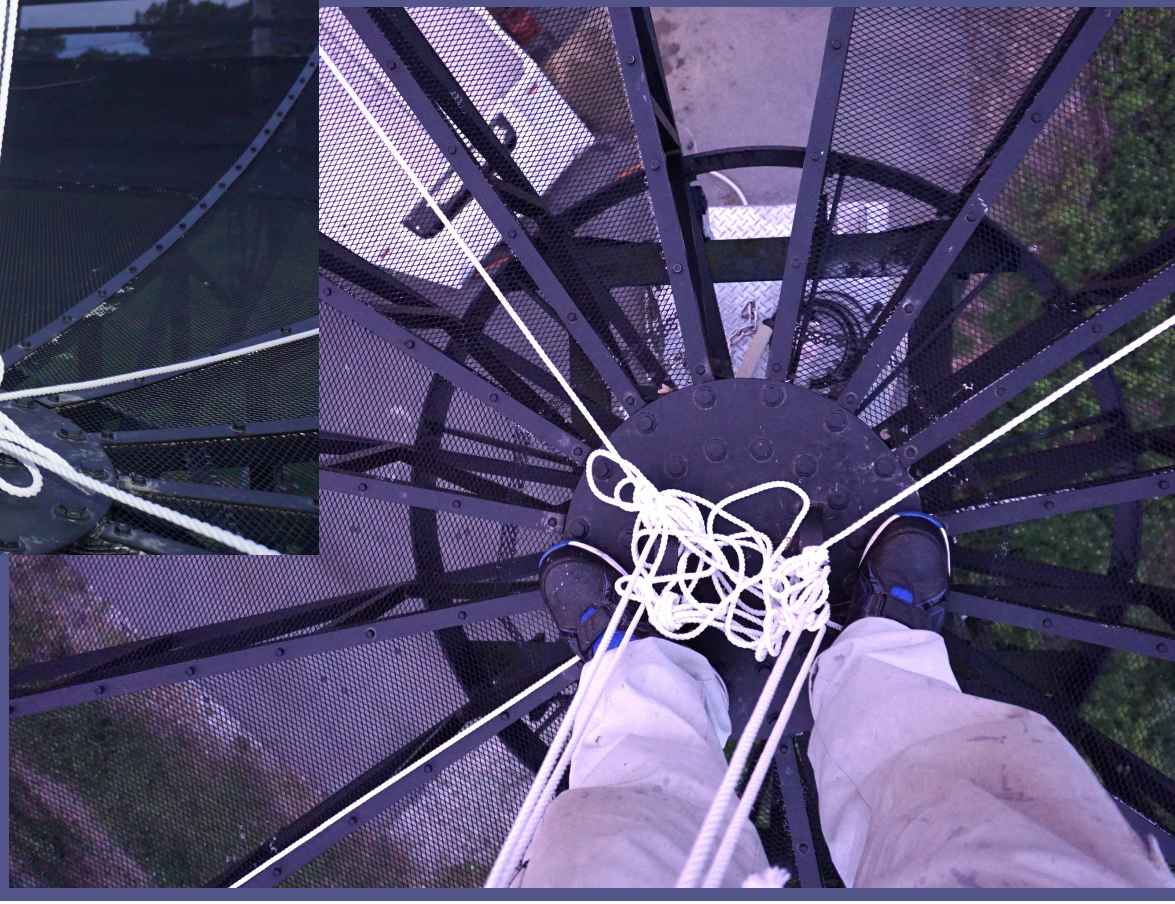
LPF-600L
6 kN
8 mm/sec.

90 deg/50”
Too fast!

Power Cylinder

UP/DOWN Limit Switches





Be Aware!!

Be Aware!!

1) PWM controls the rotation speed of motor toward normal direction. But it DOES NOT WORK as an ACCEL nor a BRAKE.

AI Drawings of COPILOT

Be Aware!!

2) Motor speed, operating in PWM mode, will increase if any wind pressure, or unbalanced wait, gives forward force.

Be Aware!!

3) Inertial moment will increase by unexpected external additional forces, such as wind pressure, or unbalance of weig

AI Drawings of COPILOT

Result

One example...

Be Aware!! (continued)

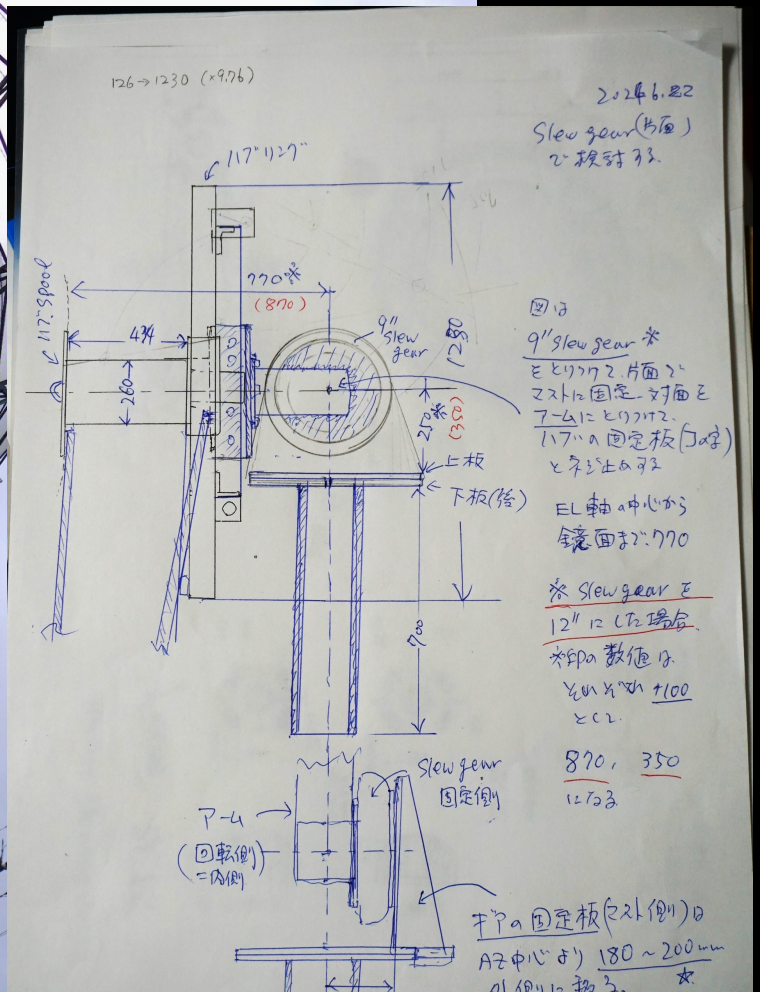
4) PWM-controlled motor does not start rotating util the PWM pulse duration and frequency give **enough energy** to motor for the initial moment of rotation, even if the motor specification and voltage are satisfactory.

5) For proper and safety motor control with PWM, **the PMW rates have to be controlled by feed-back (automatic, or manual) .**

Presently the antenna is firmly tied by lever blocks and steel chains in the zenith position.

Another POWER CYLINDER of slow speed, or SLEW WORM GEAR may be the candidates for the repair.

Solution ?


126→1230 (×9.76)
2024.6.22
Slew gear(片面)
で検討する.
ハブリング
117°Spool
770※
(870)
9" slew gear
1230
474
260
250※
(330)
上板
下板(俗)
回は
9" slew gear ※
をとりつけて片面を
マストに固定、対面を
アームにとりつけて、
ハブの固定板(下のみ)
とネジ止めする
EL軸の中心から
鏡面まで770
※ slew gear を
12" にした場合.
※印の数値は
それぞれ+100
となる.
870, 350
になる
Slew gear
固定側
アーム
(回転側)
=内側
ギアの固定板(マスト側)は
AZ中心より 180~200mm
外側に取る. ※

Slew gear drive

Essential properties of slewing gears and practical implementation for a zero backlash dish support structure and some pictures would be in these slide shows:

Michael SA6BUN (DL1YMK) Presentation about slewing gears at Orebro 2015

Silent Key on July 23, 2024

Eddy ON7UN: Rebuilding a 6 m Dish antenna (slide show), Orebro May 20, 2017

Thank you for your attention.

Also I like to say my GREAT THANKS to whom I cannot show this lecture. (R.I.P.)

Kimo JA9BOH

Bernd DL7APV

Al K2UYH

Jay K5JL

Eddy ON7UN

See you off the moon
before the next EME
conference!!
Mike JH1KRC

Any question, or kind
comment? (if time